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SECTION 00 01 15
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GENERAL REQUIREMENTS

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SECTION 01 00 00
GENERAL REQUIREMENTS

1.1 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, tenant improvements and furnish labor and materials and perform work for the expansion and remodel of the third floor Intensive Care Unit (ICU), Project Number 654-412 as required by drawings and specifications. Contractor shall comply with the requirements noted in subparagraph H "Facility Specific Requirements".
- B. Visits to the site by Bidders may be made only by appointment with the Contracting Officer.
- C. Offices of HGA Architects & Engineers as Architect and Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- D. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.
- E. Prior to commencing work, general contractor shall provide proof that a OSHA designated "competent person" (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the work site whenever the general or subcontractors are present.
- F. Training:
 - 1. All employees of general contractor or subcontractors shall have the 10-hour and 30-hour (where applicable by position) OSHA Certified Construction Safety Course and/or other relevant competency training, as determined by VA CP with input from the ICRA team. The superintendent shall have the 30-hour OSHPD certified Construction Safety course.
 - 2. Submit training records of all such employees for approval before the start of work.
- G. VHA Directive 2011-36, Safety and Health during Construction, dated 9/22/2011 in its entirety is made a part of this section.
- H. Facility Specific Requirements:

1. Contractor shall set in place and maintain a confined space program for all applicable work as outlined in this section.

- a. Confined Space

Permit Required Confined Space. Permit form is required. Among other requirements, a person stationed at the entry point is required. Formal training for workers and entry person is required.

Locations:

Permit-required confined space:

Tunnel	Mech Room / Boiler Plant
Tunnel	CLC under flag pole to Bldg. 1D
Bldg. 1D Crawl Space	Begins at half-height door at each end
Bldg. 12 Crawl Space	Includes basement access BC100
Bldg. 1-1 Clinical Lab	Access to HVAC/Plumbing
Utility Chase	Boiler Plant routes under Kirman to east end of Bldg. 1 Center Wing
Heat Aerator	Bldg. 8 Boiler Plant
Condensate Tank in pit	Bldg. 8 Boiler Plant
Boiler Mud Drums (3ea)	Bldg. 8 Boiler Plant
Boiler Steam Drums(3ea)	Bldg. 8 Boiler Plant
Boiler Fire boxes (3ea)	Bldg. 8 Boiler Plant
Electrical Vaults	Adjacent to Bldgs. 1D & 12, Courtyard
Sewers/Storms Drains	Facility Grounds
Communication Vaults	Facility Grounds

Non-permit confined space:

This category does not apply to contractors - even for investigative purposes they must treat the area as permit required and implement their confined space program accordingly.

Exception: If a VA employee escorts the contractor and remains with them 100% of the investigative time then the permit will not be required. In general, we should not plan on being their escort except for very short durations.

Permit-required confined space:

Every space identified in the list above is to be treated as permit- required.

Implement an approved confined space program.

Contractor must submit for approval their confined space program.

2. "Rules for the Contractor" is set-up as a facility specific guide for the contractor.

a. Rules of the Facility for Construction Contractors Sierra Nevada Health Care System is a multi-faceted health care facility tasked with providing health care to the men and women who have served in the armed forces of the United States of America in order to provide for the defense of this country. At all times while working within the facility grounds all contractor's employees must follow the below listed rules of the facility and treat all patients who they may come in contact with utmost respect and dignity. Any contractor employee who mistreats a veteran or violates any of the rules listed below will be removed from the facility.

1. All patient information is private and cannot be disclosed to others.

- 0 If a contractor employee sees a friend, neighbor or other acquaintance receiving health care at the facility they are not to discuss who they saw at the facility with anyone regardless of the circumstances.
- 0 Any information overheard or seen regarding a patient's medical condition is likewise not to be shared with anyone regardless of the circumstances.

2. Safety is a top priority for the facility.

- 0 Contractor must present evidence that each on-site employee has completed the 10 hour OSHA safety training course and evidence that each supervisor has completed the 30 hour OSHA safety training course for supervisors.
- 0 Contractor employees shall at all times wear proper safety attire for the work being accomplished. Further, all contractor equipment and work areas shall be observed at all times. Unattended ladders, doors to electrical closets or mechanical rooms being left open, access panels or manholes covers being moved and not protected are serious safety violations and could result in the dismissal of the

responsible employee and a stand-down for the prime and all subs. The General or Controlling Contractor is responsible for site safety, and the employer is responsible for the performance of the tasks of his/her employees. Note that the extent of the measures that a controlling employer must take to satisfy its duty to exercise reasonable care to prevent and detect violations is less than what is required of an employer with respect to protecting its own employees.

3. Electrical: De-energized Panels and Lockout/Tagout

- O All contracting firms have sole responsibility for the systems given that they install and maintain. If contractors work on energy producing systems that are normally serviced by FMS personnel, or need to control the energy to the systems for which they have responsibility, then the lockout/tagout operations will be performed by the contractor and overseen by the primary COTR who validates that the contractors have applied their lockouts/tagouts in the appropriate locations.
- O Likewise, work on electrical panels can only occur if the panel is de-energized. Likewise, all utility systems are to be shut-down and certified as being off line prior to the contractor tapping into the system.

4. Infection control is a top priority for the facility. No work will be allowed to occur anywhere within the facility until an Infection Control Risk Assessment (ICRA) form has been filled out and all required work activities properly required by the completed ICRA have been implemented including, but not limited to construction of dust barriers and **installation of HEPA filters. The hospital side of job access points must be kept pristine; use of sticky mats and** continual sweeping/mopping and other appropriate measures to keep facility areas clean are to be provided by the contractor as needed

5. Contractor employee parking. No contractor is permitted to park on hospital property with either their personal or business vehicle - use the streets. Contractor's employees vehicles found parking on campus are subject to being ticketed (with fine) by VA Police with notification to the CEO of the prime.

6. Contractor discussions regarding project details or related impact are **NOT** to occur with anyone at the VA without the

permission or presence of the COTR or other authorized representative from FMS.

7. **Contractor employee use of facility toilets and restrooms.** Unless otherwise specified in the contract drawings and/or specifications no contractor employees are to use facility toilets or restrooms.
8. **Facility work hours.** The facility is an operating health care center and as such activities occur on a 24-7 basis. However the majority of services provided by the facility occur between the hours of 7a and 5p, Monday through Friday. The contractor is to schedule all work activities as necessary to minimize the impact of the construction activities on the day-to-day operations of the facility. Unless otherwise arranged, contractor work hours are limited to 7:30a to 4p.
9. **Utility shutdown.** No utility shutdowns will be allowed without proper prior coordination with the medical center. Minor utility shutdowns (those which in no way impact patient care activities) are to be scheduled no less than 72 hours in advance of the planned shutdown. Major utility shutdowns (those which do impact patient care activities) are to be formally requested no less than 21 days in advance of the requested shutdown.
10. **Contractor's staging area.** There is limited space available for the contractor to use as a staging location. Unless otherwise noted in the contract drawings or specifications, all staging of equipment and materials is to occur within the boundaries of the limits of construction as shown on the contract documents. Dumpster/Storage Area on VA property is not permitted except within the boundaries of the construction project. Coordination for street use for dumpsters and storage is between the contractor and the City of Reno.
11. **Crane Operations.** Crane Operations are not permitted over occupied areas. Crane operations should be scheduled when occupants are not routinely under the crane ops area.
12. **Fire alarm or fire sprinkler work and/or tie-ins.** No removal, relocation, disconnection, disabling or connection to the existing facility fire alarm or fire sprinkler systems are to occur until the contractor has obtained the approval of the facility safety manager. It is recommended that wire guards be

installed over sprinkler heads within construction boundaries. The contractor is responsible for paying the cost of any fire department response when said the response is due to negligence by the contractor.

13. **Hot work.** No hot work is to occur until the contractor has received an approved hot work permit from the facility safety manager via the COR.
14. **Firearms, knives, etc.** This facility is located on federal property. In accordance with federal law, no person, unless authorized to do so (Federal police and government agents only at this facility) are allowed to carry firearms or knives on property grounds.
15. **Alcohol.** This facility is located on federal property. Therefore the possession, sale of or use of alcohol on the grounds is strictly prohibited.
16. **Smoking.** Smoking is not allowed anywhere in the facility inside buildings and only in selected areas outside buildings as defined by marks on the pavement.
17. **Fire Egress.** As a functioning medical facility it is imperative that, in the event of a disaster which requires evacuation, the evacuation routes are available to patients and staff. Blocking of stairwells, corridors, exit doors and other means of evacuation are strictly prohibited unless approved by the Facility Safety Manager as evidenced by his signature on a posted Interim Life Safety Measure (ISLM) document.
18. **Handicap Accessibility.** As a functioning medical facility it is imperative that all handicap access areas, including ramps, sidewalks, handrails, etc. remain unobstructed at all times unless approved by the Facility Safety Manager as evidenced by his signature on a posted Interim Life Safety Measure (ISLM) document.
19. **Debris removal.** All debris to be removed from a construction site off site for disposal is to be properly covered whenever it exits a construction area and enters an area occupied by the facility. Tossing of debris materials out of windows or off roof areas without proper use of a trash chute is strictly prohibited.
20. **Use of electronic equipment.** As a medical facility there is a large amount of electronic equipment that is used by the facility

to track patient condition. Hand held electronic equipment such as cell phones, walkie-talkies, radios, iPods, has the potential to impact the signals provided by the medical equipment thereby impacting patient care. Therefore no hand held electronic equipment is to be used by any contractor employee in the vicinity of areas where health care is provided.

21. Badges. Identification badges are provided for use of all contractor employees. These badges are to be worn by the employee at all times they are on facility grounds. Any contractor employee who is either not wearing or cannot, upon questioning, produce their badge is subject to be removed from the facility. A background check is performed for any employee who will be on-site more than seven days.

22. Project Submittals on Site. At all times when work is in progress the contractor is to have a set of approved submittals on site for verification that the specified and approved items are being installed. These are to be made available at any time per request of the Contracting Officer or the project COR.

23. Confined Space. Several areas within hospital grounds are considered Confined Spaces and some of those require Permit. You must have submitted and received COR approval of a contractor implemented Confined Space program prior to any access of these areas.

24. Keys. No VA key will be provided to a contractor. Access must either be via VA employee or through a contractor locking system. (Reminder: **DO NOT** prop open a door or tape the strike, etc. to get around the proper key use - such action may result in employee removal and contractor safety stand down.) The contractor must provide the COTR five spare keys to any contractor implemented locking system.

25. COR Notification. No contractor is permitted to perform on-site contract work without COTR knowledge.

3. **ASBESTOS PERMIT:** It is the responsibility of the contractor to obtain a permit from the Washoe County Health District, Air Quality Management Division (401 Ryland Street, Suite 331, Reno NV 89502) (775) 784-7200 prior to commencement of renovation/demolition activities. The Air Quality Management Division requires an asbestos survey to be conducted by a U.S. EPA AHERA certified person before

any potential asbestos containing materials are disturbed. The survey must be completed to the satisfaction of the Control Officer or additional samples may be required. A complete, signed copy of an asbestos survey report must be filed at the Washoe County District Health Department and an "Asbestos Assessment Acknowledgment Form" obtained before any permit for demolition or renovation, as noted above, is issued." The permit issued by the District must be provided to the government to begin work.

4. Weekly COR Construction Site Safety Inspection is to ensure the contractor is complying with safety and infectious controls.

Complete the form below for each inspection.

- I. Contractor shall complete the necessary procedures, documentation, and product selections for the project to achieve LEED Silver Certification. The Project shall target at least 55 LEED points for Silver certification, a certain number of points are expected from Design Phase credits. Contractor shall be responsible for achieving the Construction Phase prerequisites as well as at least 14 points through Construction Phase credits. See Figure Attachment D for the LEED Project Checklist. Credits marked "Y" are required. Credits marked as "?" are at the discretion of the Contractor, provided that the sum of Construction Phase points achieved is at least 14. It is the responsibility of the Contractor to submit to the LEED Consultant the list of Construction Phase credits that are to be pursued by the Project. The LEED requirements and submittals in these specifications only apply for those credits which are being pursued. For specific LEED requirements refer to Section 01 81 11 Sustainable Design Requirements.

1.2 STATEMENT OF BID ITEM(S)

- A. Work includes general construction, demolition, structural, mechanical, plumbing and electrical work, necessary for removal of existing medical surgery unit 2C and construction of a new Intensive Care Unit. The scope of work includes the addition of roughly 2,000 square feet at the third floor.

1.3 SOLICITATION AUTHORITY

- A. This is solicitation Request for Proposals (RFP) conducted under Far Part 15 contracting by negotiation where firms are offerors and shall submit offers. References to IFBS, bids, or bidders, in technical specification sections and technical drawings are strictly coincidental and strictly for purposes of administrative convenience and efficiency.

1.4 SOLICITATION CLAUSES AND PROVISIONS

Please note that RFP, and any resultant contract, Part I, Schedule, and all clauses and provisions located there, supersede and contain final authority. Those clauses and provisions that may be referenced in these technical specification sections and technical drawings are strictly coincidental and for purposes of administrative convenience and efficiency.

1.5 SOLICITATION DEFINITIONS

Throughout this RFP, and any resultant contract, the terms Contracting Officer's Representative (COR), Contracting Officer's Representative COR), Project Engineer (PE), Contracting Officer's Representative COR)(RE), and Project Manager (PM), all denote the same engineering official and may be used equally and interchangeably as described by the Contracting Officer CO).

A. Additional sets of drawings may be made by the Contractor, at Contractor's expense, from reproducible prints furnished by Issuing Office. Such prints shall be returned to the Issuing Office immediately after printing is completed.

1.6 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

A. Sets of drawings and specifications may be purchased by the Contractor, at Contractor's expense.

1.7 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Plan:

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

B. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
2. For working outside the "regular hours" as defined in the contract, The General Contractor shall give 3 days notice to the Contracting Officer's Representative so that security arrangements can be provided for the Contractor's employees. This notice is separate

from any notices required for utility shutdown described later in this section.

3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the Contracting Officer's Representative (COR) for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.
2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation. See Section 08 71 00, DOOR HARDWARE and coordinate.

D. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".

7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
 - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

E. Motor Vehicle Restrictions

1. Vehicle are not authorized to park on VA property at any time. Access shall be restricted to picking up and dropping off materials and supplies.

1.8 FIRE SAFETY

- A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.
1. American Society for Testing and Materials (ASTM):
 - E84-2009.....Surface Burning Characteristics of Building Materials
 2. National Fire Protection Association (NFPA):
 - 10-2010.....Standard for Portable Fire Extinguishers
 - 30-2008.....Flammable and Combustible Liquids Code
 - 51B-2009.....Standard for Fire Prevention During Welding, Cutting and Other Hot Work
 - 70-2011.....National Electrical Code
 - 241-2009.....Standard for Safeguarding Construction, Alteration, and Demolition Operations
 3. Occupational Safety and Health Administration (OSHA):
 - 29 CFR 1926.....Safety and Health Regulations for Construction

- B. Fire Safety Plan: Establish and maintain a 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 (COR) for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the General Contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, etc. Documentation shall be provided to the Contracting Officer's Representative (COR) that individuals have undergone contractor's safety briefing.
- C. 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.
- D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- E. Temporary Construction Partitions:
1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas 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 one-hour fire-rated temporary construction partitions as shown on drawings to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.
 3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-

penetration firestop materials in accordance with Section 07 84 00,
FIRESTOPPING.

- F. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- G. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Contracting Officer's Representative (COR) and facility Safety Manager.
- H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Contracting Officer's Representative (COR) and facility Safety Manager.
- I. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- J. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- K. 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 (COR) and facility Safety Manager. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the Contracting Officer's Representative (COR).
- L. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Contracting Officer's Representative (COR) and facility Safety Manager.
- M. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Contracting Officer's Representative (COR). Obtain permits from facility Safety Manager at least 48 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- N. 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 (COR) and facility Safety Manager.

- O. 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.
- P. Dispose of waste and debris in accordance with NFPA 241 and Sections 01 74 19 Construction Waste Management and 01 31 11 Sustainable Design Requirement. Remove from buildings daily.
- Q. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.
- R. If required, submit documentation to the Contracting Officer's Representative (COR) that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

1.9 OPERATIONS AND STORAGE AREAS

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

Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

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

- payment of such fee shall be the responsibility of the Government and not the Contractor.
- H. Building No. 12 will be occupied during performance of work but immediate areas of alterations will be vacated. The following criteria must be adhered to:
1. Maintain access to the portions of Building 12 which are not a part of this project.
 2. Maintain the functioning structural, mechanical, electrical, plumbing, IT, and life safety systems that feed the existing to remain portions of the building throughout the duration of the project.
 3. Minimize disruptions to the rest of the VA Reno campus.
 4. Deliver to the areas indicated, in the order and sequence as described to the COR in order to keep the remaining area of the third floor operational during construction.
- I. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, 2.1m (seven feet) minimum height, around the construction area indicated on the drawings. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Remove the fence when directed by Contracting Officer's Representative (COR).
1. Contractor may not place/park any materials, containers, trailers, vehicles etc. outside the construction fence except for very temporary and approved purposes.
- J. When a building is turned over to Contractor, Contractor shall accept entire responsibility therefore.
1. Contractor shall maintain a minimum temperature of 50 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 the Safety Manager, VA Fire Alarm Technician and VA maintenance, and a representative from the City of Reno Fire Department in attendance.

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

1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of Contracting Officer's Representative (COR). Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS for additional requirements.
2. Contractor shall submit a request to interrupt any such services to Contracting Officer's Representative (COR), in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the Contracting Officer's Representative (COR).
 - a. The System Interruption Request must include a plan of action, detailing:
 1. The specific work to be performed relative to this system interruption.

2. Detailed list of what systems will be affected, and what work will be done on those systems.
 3. Description of backup plan in the event the work is delayed, including a detailed plan for maintaining facility operation during system outage.
 5. In case of a contract construction emergency, service will be interrupted on approval of Resident Engineer. Such approval will be confirmed in writing as soon as practical.
 6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
- L. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.
- M. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times.
 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 (COR).
- N. Coordinate the work for this contract with other construction operations as directed by Contracting Officer's Representative (COR). This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

1.10 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the Contracting Officer's Representative (COR) of areas of buildings in which alterations occur and areas which are

anticipated routes of access, and furnish a report to the Contracting Officer. This report shall list by rooms and spaces:

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of the building.
 2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
 3. Shall note any discrepancies between drawings and existing conditions at site.
 4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and Contracting Officer's Representative (COR).
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of Contracting Officer's Representative (COR), to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and Contracting Officer's Representative (COR) together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's 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 inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

1.11 INFECTION PREVENTION MEASURES

- A. Implement the requirements of VAMC'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 the 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 (COR) and Facility ICRA team for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
 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. Medical center Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may 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. In addition:
 1. The RE and VAMC Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in the patient-care rooms 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.
2. In case of any problem, the medical center, along 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 (COR). Blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.
 2. Do not perform dust producing tasks within occupied areas without the approval of the Contracting Officer's Representative (COR). 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 one-hour fire-rated temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. 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 where dust control is the only hazard, and an agreement is reached with the Contracting Officer's Representative (COR) and Medical Center.
 - b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be

heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.

- c. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm (24" x 36"), 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.
 - d. 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 they are created. Transport these outside the construction area in containers with tightly fitting lids.
 - e. The contractor shall not haul debris through patient-care areas without prior approval of the Contracting Officer's Representative (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.
 - f. 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.
 - g. 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.
 - h. 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 air ducts shall be

1.12 DISPOSAL AND RETENTION

- A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:
 1. Reserved items which are to remain property of the Government are identified by attached tags or noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by Contracting Officer's Representative (COR).
 2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.
 3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.
 4. PCB Transformers and Capacitors: The Contractor shall be responsible for disposal of the Polychlorinated Biphenyl (PCB) transformers and capacitors. The transformers and capacitors shall be taken out of service and handled in accordance with the procedures of the Environmental Protection Agency (EPA) and the Department of Transportation (DOT) as outlined in Code of Federal Regulation (CFR), Titled 40 and 49 respectively. The EPA's Toxic Substance Control Act (TSCA) Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7 also apply. Upon removal of PCB transformers and capacitors for disposal, the "originator" copy of the Uniform Hazardous Waste Manifest (EPA Form 8700-22), along with the Uniform Hazardous Waste Manifest Continuation Sheet (EPA Form 8700-22A) shall be returned to the Contracting Officer who will annotate the contract file and transmit the Manifest to the Medical Center's Chief.

- a. Copies of the following listed CFR titles may be obtained from the Government Printing Office:
 - 40 CFR 261.....Identification and Listing of Hazardous Waste
 - 40 CFR 262.....Standards Applicable to Generators of Hazardous Waste
 - 40 CFR 263.....Standards Applicable to Transporters of Hazardous Waste
 - 40 CFR 761.....PCB Manufacturing, Processing, Distribution in Commerce, and use Prohibitions
 - 49 CFR 172.....Hazardous Material tables and Hazardous Material Communications Regulations
 - 49 CFR 173.....Shippers - General Requirements for Shipments and Packaging
 - 49 CFR 173.....Subpart A General
 - 49 CFR 173.....Subpart B Preparation of Hazardous Material for Transportation
 - 49 CFR 173.....Subpart J Other Regulated Material; Definitions and Preparation
 - TSCA.....Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7

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

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

or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

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

1.14 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 Resident Engineer. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the Contracting Officer's Representative (COR) before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are indicated on drawings and which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.15 PHYSICAL DATA

- A. Data and information furnished or referred to below 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.

SPEC WRITER NOTE: Insert name and address
of testing facility performing the soils
investigation work.

1. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by

(FAR 52.236-4)

- B. Subsurface conditions have been developed by core borings and test pits. Logs of subsurface exploration are shown diagrammatically on drawings.
- C. A copy of the soil report will be made available for inspection by bidders upon request to the Engineering Officer at the VA Medical Center, _____ and shall be considered part of the contract documents.
- D. Government does not guarantee that other materials will not be encountered nor that proportions, conditions or character of several materials will not vary from those indicated by explorations. Bidders are expected to examine site of work and logs of borings; and, after investigation, decide for themselves character of materials and make their bids accordingly. Upon proper application to Department of Veterans Affairs, bidders will be permitted to make subsurface explorations of their own at site.

1.16 LAYOUT OF WORK

- A. The Contractor shall lay out the work from Government established base lines and bench marks, indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks

established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

(FAR 52.236-17)

- B. Establish and plainly mark center lines for each building and/or addition to each existing building, and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each such structure and/or addition, are in accordance with lines and elevations shown on contract drawings.
- C. Following completion of general mass excavation and before any other permanent work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of work. Survey shall include, but not be limited to, location of lines and grades of footings, exterior walls, center lines of columns in both directions, major utilities and elevations of floor slabs:
 - 1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the Contracting Officer's Representative (COR) before any work (such as footings, floor slabs, columns, walls, utilities and other major controlling features) is placed.
- D. During progress of work, and particularly as work progresses from floor to floor, Contractor shall have line grades and plumbness of all major form work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of contract drawings. Furnish such certification to the Contracting Officer's Representative (COR) before any major items of concrete work are placed. In addition, Contractor shall also furnish to the Contracting Officer's Representative (COR) certificates from a registered land surveyor or registered civil engineer that the following work is complete in every respect as required by contract drawings.
 - 1. Lines of each building and/or addition.

2. Elevations of bottoms of footings and tops of floors of each building and/or addition.
 3. Lines and elevations of sewers and of all outside distribution systems.
- E. Whenever changes from contract drawings are made in line or grading requiring certificates, record such changes on a reproducible drawing bearing the registered land surveyor or registered civil engineer seal, and forward these drawings upon completion of work to Contracting Officer's Representative (COR).
- F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.17 AS-BUILT DRAWINGS

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

1.18 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the Contracting Officer's Representative (COR), 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 bridges.

1.19 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 (COR). If the equipment is not installed and maintained in accordance with the following provisions, the Contracting Officer's Representative (COR) will withdraw permission for use of the equipment.
2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.
6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
- C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.

1.20 TEMPORARY USE OF EXISTING ELEVATORS

- A. The Contractor is authorized to use the facility Freight Elevators for material, equipment and tool transfer. The use of any other facility elevators is not allowed, unless specific approval is granted by the

COTR. The access route from the work area to the Freight Elevators is shown on the attachment at the end of this Section. The contractor is required to keep the access route clean from dust and debris at all times.

- B. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:
1. Contractor makes all arrangements with the Contracting Officer's Representative (COR) for use of elevators. The Contracting Officers' Representative (COR) will ascertain that elevators are in proper condition. Contractor may use one elevator for exclusive use during construction. Exact location of Contractor's elevator shall be determined during the pre-construction meeting. 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 by 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.
 7. Contractor shall retain the services of a licensed elevator inspector to inspect the elevator and certify for facility operation

once the contractor has completed all construction related use of the elevator. Any repairs required to be made to the elevator in order to obtain the above referenced certification shall be accomplished by the contractor at his/her own cost.

1.21 TEMPORARY TOILETS

- A. Provide where directed, (for use of all Contractor's workmen) ample temporary sanitary toilet accommodations with suitable sewer and water connections; or, when approved by Contracting Officer's Representative (COR), provide suitable dry closets where directed. Keep such places clean and free from flies, and all connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean.
- B. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workmen. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

1.22 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.
- B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.
- C. Contractor shall install meters at Contractor's expense and furnish the Medical Center a monthly record of the Contractor's usage of electricity as hereinafter specified.
- D. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and

damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:

1. Obtain heat by connecting to Medical Center heating distribution system.

- a. Steam is available at no cost to Contractor.

- E. Electricity (for Construction and Testing): Furnish all temporary electric services.

1. Obtain electricity by connecting to the Medical Center electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices providing temporary heat. Electricity for all other uses is available at no cost to the Contractor.

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

1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection. 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 Medical Center's system.

- G. Steam: Furnish steam system for testing required in various sections of specifications.

1. Obtain steam for testing by connecting to the Medical Center steam distribution system. Steam is available at no cost to the Contractor.
2. Maintain connections, pipe, fittings and fixtures and conserve steam-use so none is wasted. Failure to stop leakage or other waste will be cause for revocation (at Contracting Officer's Representative's discretion), of use of steam from the Medical Center's system.

1.23 NEW TELEPHONE EQUIPMENT

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

1.24 TESTS

- A. 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 an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- C. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire complex which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a complex which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.
- D. All related components as defined above 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.

1.25 MAINTENANCE AND OPERATING MANUALS & INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic) and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals and one compact disc (four hard copies and one electronic copy each) for each separate piece of equipment shall be delivered to the Contracting Officer's Representative (COR) coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete

information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

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

1. Contractor shall provide qualified, factory trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be

at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the Contracting Officer's Representative (COR) and shall be considered concluded only when the Contracting Officer's Representative (COR) is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the Contracting Officer's Representative (COR), does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.26 GOVERNMENT-FURNISHED PROPERTY

- A. The Government shall deliver to the Contractor, the Government-furnished property shown on the drawings.
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center.
- C. Contractor shall be prepared to receive this equipment from Government and store or place such equipment not less than 90 days before Completion Date of project.
- D. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.
 - 1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
 - 2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.
- 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.

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

1.28 CONSTRUCTION SIGN

- A. Provide a Construction Sign where directed by the Contracting Officer's Representative (COR). All wood members shall be of framing lumber. Cover sign frame with 0.7 mm (24 gage) galvanized sheet steel nailed securely around edges and on all bearings. Provide three 100 by 100 mm (4 inch by 4 inch) posts (or equivalent round posts) set 1200 mm (four feet) into ground. Set bottom of sign level at 900 mm (three feet) above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with 50 x 100 mm (two by four inch) material as directed.
- 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 (COR).
- D. Detail Drawing of construction sign showing required legend and other characteristics of sign is shown on the drawings.

1.29 SAFETY SIGN

- A. Provide a Safety Sign where directed by Contracting Officer's Representative (COR). Face of sign shall be 19 mm (3/4 inch) thick exterior grade plywood. Provide two 100 mm by 100 mm (four by four inch) posts extending full height of sign and 900 mm (three feet) into ground. Set bottom of sign level at 1200 mm (four feet) above ground.
- B. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with gloss paint of colors noted.
- C. Maintain sign and remove it when directed by Contracting Officers' Representative (COR).
- D. Standard Detail Drawing Number SD10000-02(Found on VA TIL) of safety sign showing required legend and other characteristics of sign is shown on the drawings.
- E. Post the number of accident free days on a daily basis.

1.30 PHOTOGRAPHIC DOCUMENTATION

- A. During the construction period through completion, provide photographic documentation of construction progress and at selected milestones including electronic indexing, navigation, storage and remote access to the documentation, as per these specifications. Number of photographs required should be within limits included in the following table:

Estimated Cost		No. of Photographs
Up to	\$250,000	50 to 100
" "	\$500,000	100 to 150
" "	\$1,000,000	150 to 200
" "	\$2,000,000	200 to 250
" "	\$5,000,000	250 to 300
" "	\$10,000,000	300 to 400
More than	\$10,000,000	400 to 500

The commercial photographer or the subcontractor used for this work shall meet the following qualifications:

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

B. Photographic documentation elements:

1. Each digital image shall be taken with a professional grade camera with minimum size of 6 megapixels (MP) capable of producing 200x250mm (8 x 10 inch) prints with a minimum of 2272 x 1704 pixels and 400x500mm (16 x 20 inch) prints with a minimum 2592 x 1944 pixels.
2. Indexing and navigation system shall utilize actual AUTOCAD construction drawings, making such drawings interactive on an on-line interface. For all documentation referenced herein, indexing and navigation must be organized by both time (date-stamped) and location throughout the project.
3. Documentation shall combine indexing and navigation system with inspection-grade digital photography designed to capture actual conditions throughout construction and at critical milestones. Documentation shall be accessible on-line through use of an internet

- connection. Documentation shall allow for secure multiple-user access, simultaneously, on-line.
4. Before construction, the building pad, adjacent streets, roadways, parkways, driveways, curbs, sidewalks, landscaping, adjacent utilities and adjacent structures surrounding the building pad and site shall be documented. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings. If site work or pad preparation is extensive, this documentation may be required immediately before construction and at several pre-determined intervals before building work commences.
 5. Construction progress for all trades shall be tracked at pre-determined intervals, but not less than once every thirty (30) calendar days ("Progressions"). Progression documentation shall track both the exterior and interior construction of the building. Exterior Progressions shall track 360 degrees around the site and each building. Interior Progressions shall track interior improvements beginning when stud work commences and continuing until Project completion.
 6. As-built condition of pre-slab utilities and site utilities shall be documented prior to pouring slabs, placing concrete and/or backfilling. This process shall include all underground and in-slab utilities within the building(s) envelope(s) and utility runs in the immediate vicinity of the building(s) envelope(s). This may also include utilities enclosed in slab-on-deck in multi-story buildings. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive site utility plans.
 7. As-built conditions of mechanical, electrical, plumbing and all other systems shall be documented post-inspection and pre-insulation, sheet rock or dry wall installation. This process shall include all finished systems located in the walls and ceilings of all buildings at the Project. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
 8. As-built conditions of exterior skin and elevations shall be documented with an increased concentration of digital photographs as directed by the Resident Engineer in order to capture pre-determined

- focal points, such as waterproofing, window flashing, radiused steel work, architectural or Exterior Insulation and Finish Systems (EIFS) detailing. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive elevations or elevation details.
9. As-built finished conditions of the interior of each building including floors, ceilings and walls shall be documented at certificate of occupancy or equivalent, or just prior to occupancy, or both, as directed by the Resident Engineer. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
 10. Miscellaneous events that occur during any Contractor site visit, or events captured by the Department of Veterans Affairs independently, shall be dated, labeled and inserted into a Section in the navigation structure entitled "Slideshows," allowing this information to be stored in the same "place" as the formal scope.
 11. Customizable project-specific digital photographic documentation of other details or milestones. Indexing and navigation accomplished through interactive architectural plans.
 12. Monthly (29 max) exterior progressions (360 degrees around the project) and slideshows (all elevations and building envelope). The slideshows allow for the inclusion of Department of Veterans Affairs pictures, aerial photographs, and timely images which do not fit into any regular monthly photopath.
 13. Weekly (21 Max) Site Progressions - Photographic documentation capturing the project at different stages of construction. These progressions shall capture underground utilities, excavation, grading, backfill, landscaping and road construction throughout the duration of the project.
 14. Regular (8 max) interior progressions of all walls of the entire project to begin at time of substantial framed or as directed by the Resident Engineer through to completion.
 15. Detailed Exact-Built of all Slabs for all project slab pours just prior to placing concrete or as directed by the Contracting Officer's Representative (COR).
 16. Detailed Interior exact built overlapping photos of the entire building to include documentation of all mechanical, electrical and

- plumbing systems in every wall and ceiling, to be conducted after rough-ins are complete, just prior to insulation and or drywall, or as directed by Contracting Officer's Representative (COR).
17. Finished detailed Interior exact built overlapping photos of all walls, ceilings, and floors to be scheduled by Contracting Officer's Representative (COR) prior to occupancy.
18. In event a greater or lesser number of images than specified above are required by the Contracting Officer's Representative (COR), adjustment in contract price will be made in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Images shall be taken by a commercial photographer and must show distinctly, at as large a scale as possible, all parts of work embraced in the picture.
- D. Coordination of photo shoots is accomplished through Contracting Officer's Representative (COR). Contractor shall also attend construction team meetings as necessary. Contractor's operations team shall provide regular updates regarding the status of the documentation, including photo shoots concluded, the availability of new Progressions or Exact-Built viewable on-line and anticipated future shoot dates.
- E. Contractor shall provide all on-line domain/web hosting, security measures, and redundant server back-up of the documentation.
- F. Contractor shall provide technical support related to using the system or service.
- G. Upon completion of the project, final copies of the documentation (the "Permanent Record") with the indexing and navigation system embedded (and active) shall be provided in an electronic media format, typically a DVD or external hard-drive. Permanent Record shall have Building Information Modeling (BIM) interface capabilities. On-line access terminates upon delivery of the Permanent Record.

1.31 FINAL ELEVATION DIGITAL IMAGES

- A. A minimum of four (4) images of each elevation shall be taken with a minimum 6 MP camera, by a professional photographer with different settings to allow the Contracting Officer's Representative (COR) to select the image to be printed. All images are provided to the RE on a CD.
- B. Photographs shall be taken upon completion, including landscaping. They shall be taken on a clear sunny day to obtain sufficient detail to show

depth and to provide clear, sharp pictures. Pictures shall be 400 mm x 500 mm (16 by 20 inches), printed on regular weight paper, matte finish archival grade photographic paper and produced by a RA4 process from the digital image with a minimum 300 PPI. Identifying data shall be carried on label affixed to back of photograph without damage to photograph and shall be similar to that provided for final construction photographs.

- C. Furnish six (6) 400 mm x 500 mm (16 by 20 inch) color prints of the following buildings constructed under this project (elevations as selected by the Contracting Officer's Representative (COR) from the images taken above). Photographs shall be artistically composed showing full front elevations. All images shall become property of the Government. Each of the selected six prints shall be place in a frame with a minimum of 2 inches of appropriate matting as a border. Provide a selection of a minimum of 3 different frames from which the SRE will select one style to frame all six prints. Photographs with frames shall be delivered to the Contracting Officer's Representative (COR) in boxes suitable for shipping.

1.32 HISTORIC PRESERVATION

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 (COR) verbally, and then with a written follow up.

1.33 WORK DAYS AND HOURS AT PROJECT LOCATION

- A. The normal work days and hours for this project will be Monday through Friday, excluding federal holidays, from 7:30 a.m. to 4:00 p.m. Access to the work site may be restricted to these hours and days. Work during other than normal work days and hours may be required, but days and hours must still be coordinated in advance with the Contracting Officer through the COR.
- B. SNHCS, Reno, NV. Normal working hours are between 7:30 a.m. and 4:00 p.m., Monday through Friday. If the Contractor needs to perform work during hours or days other than the hours or work days stated, the Contractor shall submit a written request Seven (7) Calendar Days prior to required start of work. The request shall include number of work days, work hours, elements, labor categories, and VA Master

Specifications Construction Division Number, also starting times, ending times, and overall dates of proposed work. Work may begin during requested times only after approval of the request by the Contracting Officer.

1.34 SECURITY OF DOCUMENTS

Security requirements addressing the destructions of records, drawings, and specifications by the Contractor shall be accomplished in accordance with VA Directive 6371 dated 02 May 2008.

1.35 BRAND NAME OR EQUAL

Wherever a brand name is cited, contractor shall ensure, in any resultant contract, that any equal has the salient characteristics of the brand name. Lack of confirmation shall be grounds for Government inspection at any time and Government direction for replacement of materials or equipment by the Contractor at no increase in contract price or time.

1.36 SMOKE AND CARBON MONOXIDE MONITORING REQUIREMENTS

Contractor, his employees, his subcontractors, and their employees shall adhere to SNHCS Policies for these requirements. They are available upon request from COR.

1.37 ADDITIONAL PROJECT INFORMATION

- A. Project duration is 450 Calendar Days from Issuance of Notice to Proceed.
- B. Security Requirements. Contractors, contractor personnel, subcontractors, and subcontractor personnel shall be subject to the same Federal laws, regulations, standards, and VA Directives and Handbooks as VA and VA personnel regarding information and information system security.
- C. The Federal Government observes the following Holidays. New Year's Day, Martin Luther King's Birthday, President's Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, and Christmas Day and, any other day specifically declared by the President of the United States.

1.38 ACCESS TO VA INFORMATION AND VA INFORMATION SYSTEMS.

A. GENERAL

Contractors, contractor personnel, subcontractors, and subcontractor personnel shall be subject to the same Federal laws, regulations, standards, and VA Directives and Handbooks as VA and VA personnel regarding information and information system security.

1. A contractor/subcontractor shall request logical (technical) or physical access to VA information and VA information systems for their employees, subcontractors, and affiliates only to the extent necessary to perform the services specified in the contract, agreement, or task order.
2. All contractors, subcontractors, and third-party servicers and associates working with VA information are subject to the same investigative requirements as those of VA appointees or employees who have access to the same types of information. The level and process of background security investigations for contractors must be in accordance with VA Directive and Handbook 0710, Personnel Suitability and Security Program. The Office for Operations, Security, and Preparedness is responsible for these policies and procedures.
3. Contract personnel who require access to national security programs must have a valid security clearance. National Industrial Security Program (NISP) was established by Executive Order 12829 to ensure that cleared U.S. defense industry contract personnel safeguard the classified information in their possession while performing work on contracts, programs, bids, or research and development efforts. The Department of Veterans Affairs does not have a Memorandum of Agreement with Defense Security Service (DSS). Verification of a Security Clearance must be processed through the Special Security Officer located in the Planning and National Security Service within the Office of Operations, Security, and Preparedness.
4. Custom software development and outsourced operations must be located in the U.S. to the maximum extent practical. If such services are proposed to be performed abroad and are not disallowed by other VA policy or mandates, the contractor/subcontractor must state where all non-U.S. services are provided and detail a security plan, deemed to be acceptable by VA, specifically to address mitigation of the resulting problems of communication, control, data protection, and so forth. Location within the U.S. may be an evaluation factor.
5. The contractor or subcontractor must notify the Contracting Officer immediately when an employee working on a VA system or with access to VA information is reassigned or leaves the contractor or subcontractor's employ. The Contracting Officer must also be

notified immediately by the contractor or subcontractor prior to an unfriendly termination.

B. VA INFORMATION CUSTODIAL LANGUAGE

1. Information made available to the contractor or subcontractor by VA for the performance or administration of this contract or information developed by the contractor/subcontractor in performance or administration of the contract shall be used only for those purposes and shall not be used in any other way without the prior written agreement of the VA.
2. VA information should not be co-mingled, if possible, with any other data on the contractors/subcontractor's information systems or media storage systems in order to ensure VA requirements related to data protection and media sanitization can be met. If co-mingling must be allowed to meet the requirements of the business need, the contractor must ensure that VA's information is returned to the VA or destroyed in accordance with VA's sanitization requirements. VA reserves the right to conduct on-site inspections of contractor and subcontractor IT resources to ensure data security controls, separation of data and job duties, and destruction/media sanitization procedures are in compliance with VA directive requirements.
3. Prior to termination or completion of this contract, contractor/subcontractor must not destroy information received from VA, or gathered/created by the contractor in the course of performing this contract without prior written approval by the VA. Any data destruction done on behalf of VA by contractor/ subcontractor must be done in accordance with National Archives and Records Administration (NARA) requirements as outlined in VA Directive 6300, Records and Information Management and its Handbook 6300.1 Records Management Procedures, applicable VA Records Control Schedules, and VA Handbook 6500.1, Electronic Media Sanitization. Self-certification by the contractor that the data destruction requirements above have been met must be sent to the VA Contracting Officer within 30 days of termination of the contract.
4. The contractor/subcontractor must receive, gather, store, back up, maintain, use, disclose and dispose of VA information only in compliance with the terms of the contract and applicable Federal and VA information confidentiality and security laws, regulations and

- policies. If Federal or VA information confidentiality and security laws, regulations and policies become applicable to the VA information or information systems after execution of the contract, or if NIST issues or updates applicable FIPS or Special Publications (SP) after execution of this contract, the parties agree to negotiate in good faith to implement the information confidentiality and security laws, regulations and policies in this contract.
5. The contractor/subcontractor shall not make copies of VA information except as authorized and necessary to perform the terms of the agreement or to preserve electronic information stored on contractor/subcontractor electronic storage media for restoration in case any electronic equipment or data used by the contractor/subcontractor needs to be restored to an operating state. If copies are made for restoration purposes, after the restoration is complete, the copies must be appropriately destroyed.
 6. If VA determines that the contractor has violated any of the information confidentiality, privacy, and security provisions of the contract, it shall be sufficient grounds for VA to withhold payment to the contractor or third party or terminate the contract for default or terminate for cause under Federal Acquisition Regulation (FAR) part 12.

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SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
 - 2. Indicate prices for each alternate on bid form; if no change in price is required, indicate no change.
 - 3. Indicate on the bid form the amount to be added or deducted from the base bid, should the alternate be accepted, indicating whether it is an "ADD" or a "DEDUCT" price.
 - 4. Voluntary alternates will not be considered in evaluation of bids.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate.
Indicate if alternates have been accepted, rejected, or deferred for

later consideration. Include a complete description of negotiated modifications to alternates.

- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Deductive Alternate No. 1: Third Floor, ICU

- 1. Base Bid: Provide Patient Lifts (CFCI) in all Patient Rooms. Demo existing window glazing and sills at existing window frames to remain. Provide motorized shades and new solid surface window sills at all exterior windows. Provide custom patterned tempered glass at interior windows at Nurse Stations and Unit Entry. Provide magnetic marker boards and wall protection at all Patient Rooms. At new patient and staff bathrooms within the existing third floor building footprint, grind concrete topping slab one (1) inch to accommodate new tile flooring. At all bathrooms, install new floor and wall tile.
- 2. Alternate: Provide Patient Lifts (CFCI) in Isolation and Bariatric Rooms only, for a total of four (4) lifts. Keep existing window glazing and sills at existing frames to remain. Provide new wood window sills to match existing at all new exterior windows. Provide new manual shades. Provide clear tempered glass with a patterned film at interior windows at Nurse Stations and Unit Entry. Provide dry erase paint in lieu of the magnetic marker boards at all Patient Rooms. Provide bumper and corner guards, but do not install wall guard at all patient rooms. Do not grind existing concrete slab. Within all patient and staff bathrooms, install resilient sheet flooring with six (6) inch coved base and fiberglass-reinforced plastic wall protection.

B. Deductive Alternate No. 2: IT Room Cooling.

- 1. Base Bid: New ductless split system air conditioning unit ACO-1, related ductwork and controls from the roof to serve the IT room as indicated on Sheet 12-M113.

2. Alternate: Provide a cooling only terminal unit, connected to 12-AHU-2 as required. Location, ductwork and controls shall remain the same as the base bid.

C. Deductive Alternate No. 3: Ceilings and Casework

1. Base Bid: Gypsum board accent soffits as indicated on Sheet 12-162. Plastic laminate casework with solid surface countertops as indicated on the floor plans and interior elevations, sheets 12-211 through 12-214. Install open wall wash light fixtures for length of 2 main corridors.
2. Alternate: Remove all gypsum accent soffits and provide lay-in acoustical ceiling only. Remove all casework and countertops and provide infrastructure for future installation by Owner only. Remove distributed supply cabinet equipment. Install indirect 2 foot by 2 foot or 2 foot by 4 foot light fixtures in lieu of open wall wash light fixtures at main corridors. Shell the following rooms: B3157 Locker, B3157A Men's Bathroom, B3157B Women's Locker, B3157C Staff Lounge. Staff lounge and bathroom function to be relocated to what is currently B3135 Family Lounge. Public lounge function to be relocated to B3104 Existing Waiting.

D. Deductive Alternate No. 4: Patient Lifts, Closets, and Windows.

1. Base Bid: Provide Patient Lifts in Isolation and Bariatric Rooms only, four (4) total, as described in Deductive Alternate No. 1. Remove distributed supply cabinet equipment as described in Deductive Alternate No. 3. Install enclosing partitions, equipment structure, and all doors for supply cabinet closets. Provide clear tempered glass with a patterned film at interior windows at Nurse Supply areas facing main corridors, as described in Deductive Alternate No. 1.
2. Alternate: Remove all Patient Lifts and above-ceiling structure in all patient rooms. At distributed supply closets install stacked doors from corridor. Remove two (2) pairs of stacked access doors on patient room side and install metal stud support framing to accommodate future door installation. Finish wall per adjacent wall surface. Remove steel structure to support supply cabinet equipment. Remove interior windows between Nurse Supply areas and main corridor.

E. Deductive Alternate No. 5: Patient Booms.

1. Base Bid: Provide ceiling-mounted medical booms at all patient rooms.
2. Alternate: Provide contractor-built headwall. Modify partitions between patient rooms as required for back-to-back services.

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**SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 2. Section 01 32 16.15 PROJECT SCHEDULE for preparing and submitting Contractor's construction schedule.
 - 3. Section 01 73 00 EXECUTION REQUIREMENTS for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 4. Section 01 77 00 CLOSEOUT PROCEDURES for coordinating closeout of the Contract.
 - 5. Section 01 91 10 GENERAL COMMISSIONING REQUIREMENTS for coordinating the Work with Owner's Commissioning Authority.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. [Use CSI Form 1.5A.] Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail

addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, [on Project Web site,]and by each temporary telephone. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities [and activities of other contractors] to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor

dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fireprotection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.

- d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 - 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
 - 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
 - C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
 - 1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 - 2. File Preparation Format: [DWG] [DXF] [DGN], Version <Insert designation>, operating in [Microsoft Windows] [Apple Macintosh] operating system.
 - 3. File Submittal Format: Submit or post coordination drawing files using [format same as file preparation format] [Portable Data File (PDF) format].
 - 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in <Insert name and version of digital data software program and operating system>.
 - c. Contractor shall execute a data licensing agreement in the form of [AIA Document C106] [Agreement included in this Project Manual] [Agreement form acceptable to Owner and Architect].
- PART 2 - PRODUCTS (Not Used)
- PART 3 - EXECUTION (Not Used)

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

PART 1- GENERAL

1.1 DESCRIPTION:

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

1.2 CONTRACTOR'S REPRESENTATIVE:

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

1.3 CONTRACTOR'S CONSULTANT:

- A. The Contractor shall submit a qualification proposal to the COTR, within 10 days of bid acceptance. The qualification proposal shall include:
1. The name and address of the proposed consultant.
 2. Information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
 3. A representative sample of prior construction projects, which the proposed consultant has performed complete project scheduling services. These representative samples shall be of similar size and scope.
- B. The Contracting Officer has the right to approve or disapprove the proposed consultant, and will notify the Contractor of the VA decision within seven calendar days from receipt of the qualification proposal. In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor shall

have their scheduling consultant approved prior to submitting any schedule for approval.

1.4 COMPUTER PRODUCED SCHEDULES

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

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

- A. Within 45 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or

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

- B. Within 30 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or his representative, will do one or both of the following:
1. Notify the Contractor concerning his actions, opinions, and objections.
 2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.
- C. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.
- D. The Complete Project Schedule shall contain all work activities/events.

1.6 WORK ACTIVITY/EVENT COST DATA

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

1.7 PROJECT SCHEDULE REQUIREMENTS

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
 - 1. Show activities/events as:
 - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
 - b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
 - c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.

- d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
 - e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
 2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
 3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the COTR may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals will not be less than 20 work days.
 4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
 5. The schedule shall be generally numbered in such a way to reflect either discipline, phase or location of the work.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
 1. The appropriate project calendar including working days and holidays.
 2. The planned number of shifts per day.
 3. The number of hours per shift.Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.
- C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COTR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable

completion date of each phase regardless of the COTR's approval of the Project Schedule.

- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA an electronic file(s) containing one file of the data required to produce a schedule, reflecting all the activities/events of the complete project schedule being submitted.
- E. Overall project schedule must be updated each month. A two to three week lookahead schedule must be submitted by the close of business, on the Friday of each week.

1.8 PAYMENT TO THE CONTRACTOR:

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

1.9 PAYMENT AND PROGRESS REPORTING

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the COTR and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other data required and provide this information to the COTR three work days in advance of the schedule update meeting. Job progress will be reviewed to verify:
 - 1. Actual start and/or finish dates for updated/completed activities/events.
 - 2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
 - 3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.

4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
 5. Completion percentage for all completed and partially completed activities/events.
 6. Logic and duration revisions required by this section of the specifications.
 7. Activity/event duration and percent complete shall be updated independently.
- B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and resident engineer for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by the resident engineer. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the resident engineer within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**
- D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work

activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
 - 1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
 - 2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
 - 3. Reschedule the work in conformance with the specification requirements.
- B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the COTR for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor into the Project Schedule before the next update, at no additional cost to the Government.

1.11 CHANGES TO THE SCHEDULE

- A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:
 - 1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.

2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
 3. The schedule does not represent the actual prosecution and progress of the project.
 4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.
- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.
- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA representative.
- D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COTR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.
- B. Actual delays in activities/events which, according to the computer-produced calendar-dated schedule, do not affect the extended and

predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.

- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

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

- 1.1 Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1.2 For the purposes of this contract, samples including laboratory samples to be tested, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1.3 Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
 - A. Satisfactory written evidence is presented to, and approved by Contracting Officer, 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 including any laboratory samples to be tested will not serve as a basis for extending contract time for completion.
- 1.5 Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by Resident Engineer on behalf of the Contracting Officer.
- 1.6 Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1.7 The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefor by Contracting Officer, 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 FAX 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 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 Resident Engineer and to Architect-Engineer simultaneously with submission of material to a commercial testing laboratory.
 5. Laboratory test reports shall be sent directly to Resident Engineer 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 Resident Engineer at the site until completion of contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract.

Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.

F. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.

1. For each drawing required, submit one legible photographic paper or vellum reproducible.
2. Reproducible shall be full size.
3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
4. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
7. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.

1.10 Samples (except laboratory samples), shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to:

HGA Architects & Engineers
1410 Rocky Ridge Drive, Suite 250
Roseville, CA 95661

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 Resident Engineer.

1.12 The Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received more than 60 days after commencement of the Work may be considered or rejected at the discretion of the Architect. All substitutions complying with the performance required by the specified products, materials, and assemblies that do not compromise the aesthetic intent as determined by the Architect will be considered as equal and allowed. Any additional costs

associated with a substitution shall be at no additional cost to the Owner, and the Contractor shall be solely responsible for coordination of all associated assembly and layout revisions due to the aforementioned substitution.

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SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

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

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

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

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

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

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

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

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

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

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
GA	Gypsum Association http://www.gypsum.org
GSA	General Services Administration http://www.gsa.gov

HI	Hydraulic Institute http://www.pumps.org
HPVA	Hardwood Plywood & Veneer Association http://www.hpva.org
ICBO	International Conference of Building Officials http://www.icbo.org
ICEA	Insulated Cable Engineers Association Inc. http://www.icea.net
\ICAC	Institute of Clean Air Companies http://www.icac.com
IEEE	Institute of Electrical and Electronics Engineers http://www.ieee.org
IMSA	International Municipal Signal Association http://www.imsasafety.org
IPCEA	Insulated Power Cable Engineers Association
NBMA	Metal Buildings Manufacturers Association http://www.mbma.com
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc. http://www.mss-hq.com
NAAMM	National Association of Architectural Metal Manufacturers http://www.naamm.org
NAPHCC	Plumbing-Heating-Cooling Contractors Association http://www.phccweb.org.org
NBS	National Bureau of Standards See - NIST
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors http://www.nationboard.org
NEC	National Electric Code See - NFPA National Fire Protection Association
NEMA	National Electrical Manufacturers Association http://www.nema.org
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>

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

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:

This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained by Department of Veterans.

1.2 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - T27-11.....Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 - T96-02 (R2006).....Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - T99-10.....Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
 - T104-99 (R2007).....Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
 - T180-10.....Standard Method of Test for Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
 - T191-02(R2006).....Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method
- C. American Concrete Institute (ACI):
 - 506.4R-94 (R2004).....Guide for the Evaluation of Shotcrete
- D. American Society for Testing and Materials (ASTM):
 - A325-10.....Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - A370-12.....Standard Test Methods and Definitions for Mechanical Testing of Steel Products
 - A416/A416M-10.....Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

A490-12.....Standard Specification for Heat Treated Steel
Structural Bolts, 150 ksi Minimum Tensile
Strength

C31/C31M-10.....Standard Practice for Making and Curing Concrete
Test Specimens in the Field

C33/C33M-11a.....Standard Specification for Concrete Aggregates

C39/C39M-12.....Standard Test Method for Compressive Strength of
Cylindrical Concrete Specimens

C109/C109M-11b.....Standard Test Method for Compressive Strength of
Hydraulic Cement Mortars

C136-06.....Standard Test Method for Sieve Analysis of Fine
and Coarse Aggregates

C138/C138M-10b.....Standard Test Method for Density (Unit Weight),
Yield, and Air Content (Gravimetric) of Concrete

C140-12.....Standard Test Methods for Sampling and Testing
Concrete Masonry Units and Related Units

C143/C143M-10a.....Standard Test Method for Slump of Hydraulic
Cement Concrete

C172/C172M-10.....Standard Practice for Sampling Freshly Mixed
Concrete

C173/C173M-10b.....Standard Test Method for Air Content of freshly
Mixed Concrete by the Volumetric Method

C330/C330M-09.....Standard Specification for Lightweight
Aggregates for Structural Concrete

C567/C567M-11.....Standard Test Method for Density Structural
Lightweight Concrete

C780-11.....Standard Test Method for Pre-construction and
Construction Evaluation of Mortars for Plain and
Reinforced Unit Masonry

C1019-11.....Standard Test Method for Sampling and Testing
Grout

C1064/C1064M-11.....Standard Test Method for Temperature of Freshly
Mixed Portland Cement Concrete

C1077-11c.....Standard Practice for Agencies Testing Concrete
and Concrete Aggregates for Use in Construction
and Criteria for Testing Agency Evaluation

C1314-11a.....Standard Test Method for Compressive Strength of
Masonry Prisms

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

D698-07e1.....Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Standard Effort

D1140-00(2006).....Standard Test Methods for Amount of Material in
Soils Finer than No. 200 Sieve

D1143/D1143M-07e1.....Standard Test Methods for Deep Foundations Under
Static Axial Compressive Load

D1188-07e1.....Standard Test Method for Bulk Specific Gravity
and Density of Compacted Bituminous Mixtures
Using Coated Samples

D1556-07.....Standard Test Method for Density and Unit Weight
of Soil in Place by the Sand-Cone Method

D1557-09.....Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Modified Effort
(56,000ft lbf/ft³ (2,700 KNm/m³))

D2166-06.....Standard Test Method for Unconfined Compressive
Strength of Cohesive Soil

D2167-08).....Standard Test Method for Density and Unit Weight
of Soil in Place by the Rubber Balloon Method

D2216-10.....Standard Test Methods for Laboratory
Determination of Water (Moisture) Content of
Soil and Rock by Mass

D2974-07a.....Standard Test Methods for Moisture, Ash, and
Organic Matter of Peat and Other Organic Soils

D3666-11.....Standard Specification for Minimum Requirements
for Agencies Testing and Inspecting Road and
Paving Materials

D3740-11.....Standard Practice for Minimum Requirements for
Agencies Engaged in Testing and/or Inspection
of Soil and Rock as used in Engineering Design
and Construction

D6938-10.....Standard Test Method for In-Place Density and
Water Content of Soil and Soil-Aggregate by
Nuclear Methods (Shallow Depth)

E94-04(2010).....Standard Guide for Radiographic Examination

E164-08.....Standard Practice for Contact Ultrasonic Testing
of Weldments

E329-11c.....Standard Specification for Agencies Engaged in
Construction Inspection, Testing, or Special
Inspection

E543-09.....Standard Specification for Agencies Performing
Non-Destructive Testing
E605-93(R2011).....Standard Test Methods for Thickness and Density
of Sprayed Fire Resistive Material (SFRM)
Applied to Structural Members
E709-08.....Standard Guide for Magnetic Particle Examination
E1155-96(R2008).....Determining FF Floor Flatness and FL Floor
Levelness Numbers

E. American Welding Society (AWS):

D1.D1.1M-10.....Structural Welding Code-Steel

1.3 REQUIREMENTS:

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Resident Engineer. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Resident Engineer to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to Resident Engineer, Contractor, unless other arrangements are agreed to in writing by the Resident Engineer. Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Resident Engineer immediately of any irregularity.

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 Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Resident Engineer 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 to verify that earthwork compaction obtained is in accordance with contract documents.
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 ASTM D698 and/or ASTM D1557.
2. Make field density tests in accordance with the primary testing method following ASTM D2922 wherever possible. Field density tests utilizing ASTM D1556 or ASTM D2167 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 Resident Engineer before the tests are conducted.
 - a. Building Slab Subgrade: At least one test of subgrade for every 185 m² (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 1200 mm (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 Resident Engineer. 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.
- D. Testing Materials: Test suitability of on-site and off-site borrow as directed by Resident Engineer.

3.2 FOUNDATION CAISSONS:

- A. Concrete Testing: Test concrete including materials for concrete as required in Article, CONCRETE of this section, except make two test cylinders for each day's placement of concrete.
- B. Maintain a record of concrete used in each caisson. Compare records with calculated volumes.
- C. Inspect percussion hole in bottom of each caisson to determine that material is capable of supporting design load.
- D. Inspect sides and bottom of each caisson for compliance with contract documents.
- E. Submit a certified "Caisson Field Record" for each caisson, recording actual elevation at bottom of shaft; final center line location of top; variation of shaft from plumb; results of all tests performed; actual allowable bearing capacity of bottom; depth of socket into rock; levelness of bottom; seepage of water; still water level (if allowed to flood); variation of shaft (from dimensions shown); location and size of reinforcement, and evidence of seams, voids, or channels below the bottom. Verify the actual bearing capacity of the rock strata by the use of a calibrated penetrometer or other acceptable method.

3.3 CONCRETE:

- A. 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. Resident Engineer 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 day. For concrete not required to be air-entrained, test every 80 m³ (100 cubic yards) at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
9. Verify that specified mixing has been accomplished.
10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
 - a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.

- b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
 11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
 12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
 13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
 14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
 15. Observe preparations for placement of concrete:
 - a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
 - b. Inspect preparation of construction, expansion, and isolation joints.
 16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
 17. Observe concrete mixing:
 - a. Monitor and record amount of water added at project site.
 - b. Observe minimum and maximum mixing times.
 18. Measure concrete flatwork for levelness and flatness as follows:
 - a. Perform Floor Tolerance Measurements F_F and F_L in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.
 - b. Perform all floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
 - c. Provide the Contractor and the Resident Engineer with the results of all profile tests, including a running tabulation of the overall F_F and F_L values for all slabs installed to date, within 72 hours after each slab installation.
 19. Other inspections:
 - a. Grouting under base plates.
 - b. Grouting anchor bolts and reinforcing steel in hardened concrete.
- C. Laboratory Tests of Field Samples:

1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by Resident Engineer. 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 Resident Engineer. In test report, indicate the following information:
 - a. Cylinder identification number and date cast.
 - b. Specific location at which test samples were taken.
 - c. Type of concrete, slump, and percent air.
 - d. Compressive strength of concrete in MPa (psi).
 - e. Weight of lightweight structural concrete in kg/m^3 (pounds per cubic feet).
 - f. Weather conditions during placing.
 - g. Temperature of concrete in each test cylinder when test cylinder was molded.
 - h. Maximum and minimum ambient temperature during placing.
 - i. Ambient temperature when concrete sample in test cylinder was taken.
 - j. Date delivered to laboratory and date tested.

3.4 STRUCTURAL STEEL:

- A. General: Provide shop and field inspection and testing services to certify structural steel work is done in accordance with contract documents. Welding shall conform to AWS D1.1 Structural Welding Code.
- B. Prefabrication Inspection:
 1. Review design and shop detail drawings for size, length, type and location of all welds to be made.
 2. Approve welding procedure qualifications either by pre-qualification or by witnessing qualifications tests.
 3. Approve welder qualifications by certification or retesting.
 4. Approve procedure for control of distortion and shrinkage stresses.
 5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.
- C. Fabrication and Erection:
 1. Weld Inspection:

- a. Inspect welding equipment for capacity, maintenance and working condition.
 - b. Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.
 - c. Inspect preparation and assembly of materials to be welded for conformance with AWS D1.1.
 - d. Inspect preheating and interpass temperatures for conformance with AWS D1.1.
 - e. Measure 25 percent of fillet welds.
 - f. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:
 - 1) 20 percent of all shear plate fillet welds at random, final pass only.
 - 2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
 - 3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
 - 4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
 - 5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.
 - g. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.
 - h. Welding Radiographic Testing: Test in accordance with ASTM E94, and AWS D1.1 for 5 percent of all full penetration welds at random.
 - i. Verify that correction of rejected welds are made in accordance with AWS D1.1.
 - j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.
2. Bolt Inspection:
- a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM 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.
- D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Resident Engineer.

3.5 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 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 Resident Engineer.

3.6 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 Resident Engineer.

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**SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. If needed, insert use-charge requirements for other utilities needed for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- D. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.

3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADAABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 7 feet (2.1 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide [concrete] [galvanized-steel] bases for supporting posts.
- B. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).
- C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

- B. Tree and Plant Protection: Install temporary fencing located outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- C. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose portion of Project site determined sufficient to accommodate construction operations in Healing Garden Area.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- E. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- G. Temporary Fire Protection: Install and maintain temporary fireprotection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fireprotection

purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.4 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24- hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

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SECTION 01 52 50
SAFETY REQUIREMENTS

PART 1 GENERAL

1.1 REFERENCES

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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI A10.14 (1991) Construction and Demolition **Operations - Requirements for Safety Belts**, Harnesses, Lanyards and Lifelines for Construction and Demolition Use
- ANSI Z359.1 (1992) Safety Requirements for Personal Fall Arrest Systems

CODE OF FEDERAL REGULATIONS (CFR)

- 29 CFR 1910.94 Ventilation
- 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
- 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response
- 29 CFR 1926.502(f) Warning Line Systems

CORPS OF ENGINEERS (COE)

- COE EM-385-1-1 (1996) Safety and Health Requirements Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 70 (1996) National Electrical Code
- NFPA 241 (1996) Safeguarding Construction, Alteration, and Demolition Operations

1.2 DEFINITIONS

- A. Certified Industrial Hygienist. An industrial hygienist is an individual who is certified by the American Board of Industrial Hygiene.
- B. Certified Safety Professional. A safety manager, safety specialist, or safety engineer that has passed the CSP exam administered by the Board of Certified Safety Professionals.
- C. Confined Space. A space which by design has limited openings for entry and exit, unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy, engulfment or any other recognized safety or health hazard. Confined spaces include, but are not limited to storage tanks,

process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines.

- D. Multi-employer work site (MEWS). The prime contractor is the "controlling authority" for all work site safety and health of the subcontractors.
- E. Recordable Occupational Injuries or Illness. An occupational injury or illnesses which result in serious injuries, lost workday cases, non-fatal cases or significant mishaps.
- F. Serious Injuries & Fatalities. Regardless of the time between the injury and death or the length of the illness; hospitalization of three or more employees; or property damage in excess of \$200,000.
- G. Lost Workday Cases. Injuries, other than fatalities, that result in lost workdays.
- H. Non-Fatal Cases. Cases without lost workdays which result in transfer to another job or termination of employment, or require medical treatment (other than first aid) or involve property damage in excess of \$10,000 but less than \$200,000 or involve: loss of consciousness or restriction of work or motion. This category also includes any diagnosed occupational illnesses which are reported to the employer but are not classified as fatalities or lost workday cases.
- I. Health and Safety Plan (HASP). The HASP is the VA equivalent Army term of SHP or SSHP used in COE EM-385-1-1. "USACE" property and equipment specified in COE EM-385-1-1 should be interpreted as Government property and equipment.
- J. Safety Officer. The superintendent or QC Manager who is responsible, qualified and competent for the on-site safety required for the project.
- K. Significant Contractor Mishap. A contractor mishap which involves falls of 4 feet or more, electrical mishaps, confined space mishaps, diving mishaps, equipment mishaps, and fire mishaps which result in a lost time injury, or property damage of \$10,000 or more, but less than \$200,000; or when fire department or emergency medical treatment (EMT) assistance is required.
- L. 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 provided by a physician or registered personnel.
- M. First Aid. A one-time treatment, and follow-up visit for the purpose of observation, of minor scratches, cuts, burns, splinters, and so forth,

which do not ordinarily require medical care, even though provided by a physician or registered professional personnel.

- N. Lost Workdays. The number of days (consecutive or not) after, but not including, the day of injury or illness during which the employee would have worked but could not do so; that is, could not perform all or part of his normal assignment during all or any part of the workday or shift; because of the occupational injury or illness.

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
1. Infectious Control Risk Assessment
 2. Health and Safety Plan (HASP)
- B. Infectious Control Risk Assessment.
1. The Contractor shall prepare an Infectious Control Risk Assessment for each area and phase of construction. The attached for shall be used for this assessment.
- C. Health and Safety Plan (HASP)
1. Allow 30 calendar days for review by the VA.

1.4 QUALITY ASSURANCE

- A. Qualifications
1. Qualifications of Safety Officer:
 - a. Ability to manage the on-site contractor safety program through appropriate management controls,
 - b. Ability to identify hazards and have the capability to expend resources necessary to abate the hazards.
 - c. Must have worked on similar types of projects that are equal to or exceed the scope of the project assigned with the same responsibilities.
 2. Qualifications of Qualified Person, Confined Space Entry. The qualified person shall be capable (by education and specialized training) of anticipating, recognizing, and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and protective action to ensure worker safety.
 3. Qualification of Crane Operators. Crane operators shall meet the requirements in COE EM-385-1-1, Appendix G.
- B. Qualifications of Qualified Person, Confined Space Entry The qualified person shall be capable (by education and specialized training) of anticipating, recognizing, and evaluating employee exposure to hazardous

substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and protective action to ensure worker safety.

C. Qualification of Crane Operators. Crane operators shall meet the requirements in COE EM-385-1-1, Appendix G.

D. Meetings

1. Preconstruction Conference

a. The Contractor's Safety Officer shall attend the preconstruction conference.

2. Meeting on Work Procedures

a. Meet with Contracting Officer to discuss work procedures and safety precautions required by the HASP. Ensure the participation of the Contractor's superintendent, the Quality Control, and the CSP or CIH.

3. Weekly Safety Meetings

a. Hold weekly. Attach minutes showing contract title, signatures of attendees and a list of topics discussed to the QC Contractor Quality Control daily report.

1.5 INFECTIOUS CONTROL RISK ASSESSEMENT

Prepare for each phase of the work. As a minimum, define activity being performed, sequence of work, specific hazards anticipated, control measures to eliminate or reduce each hazard to acceptable levels, training requirements for all involved, and the competent person in charge of that phase of work.

1.6 HEALTH AND SAFETY PLAN (HASP)

Prepare as required by 29 CFR 1910.120 and COE EM-385-1-1.

A. Qualified Personnel

1. Retain a Certified Industrial Hygienist (CIH) or a Certified Safety Professional (CSP) to prepare the HASP, conduct activity hazard analyses, and prepare detailed plan for demolition, removal, and disposal of materials.

B. Contents

1. In addition to the requirements of COE EM-385-1-1, Table 28-1, the HASP must include:

- a. Location, size, and details of control areas.
- b. Location and details of decontamination systems.
- c. Interface of trades involved in the construction.
- d. Sequencing of work.
- e. Disposal plan.
- f. Sampling protocols.

- g. Testing labs.
- h. Protective equipment.
- i. Pollution control.
- j. Evidence of compliance with 29 CFR 1910.120 and 29 CFR 1926.65.
- k. Training and certifications of CIH, CSP or other competent persons.

1.7 DRUG PREVENTION PROGRAM

Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Ensure that no employees either use illegal drugs or consume alcohol during work hours. Ensure no employees under the influence of drugs or alcohol during work hours.

1.8 DUTIES OF THE SAFETY OFFICER

- A. Ensure construction hazards are identified and corrected.
- B. Maintain applicable safety reference material on the job site.
- C. Maintain a log of safety inspections performed.
- D. Attend the pre-construction conference.

1.9 DISPLAY OF SAFETY INFORMATION

Display the following information in clear view of the on-site construction personnel:

- A. Map denoting the route to the nearest emergency care facility with emergency phone numbers.
- B. Confined space entry permit.
- C. Sign with number of hours worked since last lost workday accident.

1.10 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturers' manuals.

1.11 HIGH HAZARD WORK AND LONG DURATION

Work under this contract is potentially hazardous. Pursuant to contract clause "FAR 52.236-13, Accident Prevention, Alternate I," submit in writing additional proposals for effecting accident prevention under hazardous conditions. Meet in conference with Contracting Officer to discuss and develop mutual understanding relative to the administration of the overall safety program.

1.12 EMERGENCY MEDICAL TREATMENT

Contractors shall arrange for their own emergency medical treatment. Government has no responsibility to provide. However, if emergency medical care is rendered by VA medical services, charges will be billed to Contractor's workmen's compensation insurance company at prevailing rates.

1.13 SITE CONDITIONS

A. Noise

1. Enforce hearing protection protecting Contractor's site personnel from Government or Contractor produced noise.

1.14 REPORTS

A. Reporting Reports

1. For OSHA recordable accidents, the prime contractor shall conduct a suitable investigation, and provide a written report to the Contracting Officer within 5 calendar days of the accident.

B. Notification

1. Notify Contracting Officer, within 4 hours, of any accident meeting the definition of OSHA recordable occupational injury or illness. Information shall include Contractor name; contract title; type of contract; name of activity, installation or location where mishap occurred; date and time of mishap; names of personnel injured; extent of property damage, if any; and brief description of mishap (to include type of construction equipment used, PPE used, etc.) In addition to OSHA reporting requirements, initial notification shall be made of any accident involving significant mishaps.

C. OSHA Citations and Violations

1. Provide the Contracting Officer with a copy of each OSHA citation, OSHA report and Contractor response. Correct violations and citations promptly and provide written corrective actions to the Contracting Officer.

PART 2 PRODUCTS

2.1 FALL PROTECTION ANCHORAGE

Fall protection anchorages, used by contractors to protect their people, shall be left in place and so identified for continued customer use.

2.2 CONFINED SPACE SIGNAGE

Provide permanent signs integral to or securely attached to access covers for new confined spaces. Signs wording: "DANGER--PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER -" on bold letters a minimum of one inch in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" and shall be red and readable from 5 feet.

PART 3 EXECUTION

3.1 CONSTRUCTION

Comply with COE EM-385-1-1, NFPA 241, the Infectious Control Risk Assessment and other related submittals and activity fire and safety regulations.

- A. Hazardous Material Exclusions. Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/nonionizing radiation as well as materials which contain asbestos, mercury or polychlorinated biphenyls, diisocyanates, lead-based paint are prohibited. Exceptions to the use of any of the above excluded materials may be considered by Contracting Officer upon written request by Contractor.
- B. Unforeseen Hazardous Material. The design should have identified materials such as PCB, lead paint, and friable and nonfriable asbestos. If additional material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PERSONNEL PROTECTION

- A. Hazardous Noise. Provide hazardous noise signs, and hearing protection, wherever equipment and work procedures produce sound-pressure levels greater than 85 dBA steady state or 140 dBA impulse, regardless of the duration of the exposure.
- B. Fall Protection. Enforce use of the fall protection device named for each activity in the AHA all times when an employee is on a surface 6 feet or more above lower levels. Personal fall arrest systems are required when working from an articulating or extendible boom, scissor lifts, swing stages, or suspended platform. Fall protection must comply with ANSI A10.14.
 - 1. Personal Fall Arrest Device. Equipment, subsystems, and components shall meet ANSI Z359.1, Personal Fall Arrest Systems. Only a full-body harness with a shock absorbing lanyard is an acceptable personal fall arrest device. Body belts may only be used as positioning devices only such as for steel reinforcing assembly. Body belts are not authorized as a personal fall arrest device. Harnesses must have upper middle back "D" rings for proper body suspension during a fall.

- Lanyard must be fitted with a double locking snap hook attachment. Webbing, straps, and ropes must be of synthetic fiber or wire rope.
2. Fall Protection for Roofs
 - a. For work within 6 feet of an edge, on low-pitched roofs, personnel shall be protected by use of personal fall arrest systems, guardrails, and safety nets. Safety monitoring system is not adequate fall protection and is not authorized.
 - b. For work greater than 6 feet from an edge, warning lines shall be erected and installed in accordance with 29 CFR 1926.502(f).
 - c. Work on steep roofs requires personal fall arrest, guardrails with toe boards, or safety nets. This requirement includes residential or housing type construction.
 3. Safety Nets. Safety nets shall be provided in unguarded workplaces over water, machinery, dangerous operations, or more than 25 feet above surface.
- C. Scaffolding. Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Contractor shall ensure that employees that are qualified perform scaffold erection. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection plan. Minimum platform size shall be based on the platform not being greater in height than four times the dimension of the smallest width dimension for rolling scaffold. Some Baker type scaffolding has been found not to meet these requirements. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward. The first tie-in shall be at the height equal to 4 times the width of the scaffold base.
- D. Use of Material Handling Equipment
1. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions. Crane supported work platforms shall only be used in extreme conditions if the Contractor proves that using any other access to the work location would provide a greater hazard to the workers.
 2. Cranes must be equipped with Load Indicating Devices, anti-two blocks devices, load, and boom angle moment indicating indicators.
 3. Christmas-tree lifting (multiple rigged materials) is not allowed.

- E. Excavations. The competent person for excavation shall be on site when work is being performed in excavation, and shall inspect excavations prior to entry by workers. Individual must evaluate for all hazards, including atmospheric, that may be associated with the work, and shall have the resources necessary to correct hazards promptly.
- F. Conduct of Electrical Work. Underground electrical spaces must be certified safe for entry before entering to conduct work. Cable intended to be cut must be positively identified and de-energized prior to performing each cut. Perform all high voltage cutting remotely. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personnel protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses.
- G. Work in Manholes. Contractor shall provide mechanical ventilation for all work accomplished in manholes, unless other hazards are present like friable asbestos.
- H. Work in Confined Spaces. Comply with the requirements in Section 06.I of COE EM-385-1-1. Any potential for a hazard in the confined space requires a permit system to be used.
 - 1. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.05 of COE EM-385-1-1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.
 - 2. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained.
 - 3. Ensure the use of rescue and retrieval devices in confined spaces greater than 5 feet in depth. Conform to Sections 06.I.09, 06.I.10 and 06.I.11 of COE EM-385-1-1.

4. Sewer vent walls require continuous atmosphere monitoring with audible alarm for toxic gas detection.
5. Include training information for employees who will be involved as entrant attendants for the work. Conform to Section 06.I.06 of COE EM-385-1-1.
6. Entry Permit. Use ENGFORM 5044-R or other form with the same minimum information for the Daily Confined Space Entry Permit, completed by the qualified person. Post the permit in a conspicuous place close to the confined space entrance.
- I. Crystalline Silica. Grinding, abrasive blasting, and foundry operations of construction materials containing crystalline silica, shall comply with OSHA regulations, such as 29 CFR 1910.94, and COE EM-385-1-1, (Appendix C). The Contractor shall develop and implement effective exposure control and elimination procedures to include dust control systems, engineering controls, and establishment of work area boundaries, as well as medical surveillance, training, air monitoring, and personal protective equipment.

3.3 ACCIDENT SCENE PRESERVATION

- A. For serious accidents, ensure the accident site is secured and evidence is protected remaining undisturbed until released by the Contracting Officer.

3.4 FIELD QUALITY CONTROL

- A. Inspections. Include safety inspection as a part of the daily Quality Control inspections.

- - - E N D - - -

SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

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

7. Sanitary Wastes:

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

1.2 QUALITY CONTROL

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

1.3 REFERENCES

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

1.4 SUBMITTALS

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

- f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
 - g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
 - h. Permits, licenses, and the location of the solid waste disposal area.
 - i. 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 Resident Engineer. 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.
 - 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 Resident Engineer.
 - 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 shown. 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 and off Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
 7. Manage and control spoil areas on and off 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.
 11. Handle discarded materials other than those included in the solid waste category as directed by the Resident Engineer.
- 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
 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 Nevada 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.

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 Resident Engineer. 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 Resident Engineer. 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, STATIONARY	80	PNEUMATIC TOOLS	80
PUMPS	75	BLASTING	75
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

- b. Use shields or other physical barriers to restrict noise transmission.
- c. Provide soundproof housings or enclosures for noise-producing machinery.
- d. Use efficient silencers on equipment air intakes.
- e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
- f. Line hoppers and storage bins with sound deadening material.
- g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 70 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face.

Submit the recorded information to the Resident Engineer 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 Resident Engineer. 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.

- - - E N D - - -

SECTION 01 58 16
TEMPORARY INTERIOR SIGNAGE

PART 1 GENERAL

DESCRIPTION

This section specifies temporary interior signs.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNS

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

PART 3 EXECUTION

3.1 INSTALLATION

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

3.2 LOCATION

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

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**SECTION 01 70 00
EXECUTION REQUIREMENTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections:
 - 1. Division 1 Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES for submitting surveys.
 - 2. Division 2 Section 02 41 00, DEMOLITION for demolition and removal of selected portions of the building.
 - 3. Division 1 Section 01 77 00, CLOSEOUT PROCEDURES for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 4. Division 7 Section 07 84 00, FIRESTOPPING for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by land surveyor.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Resident Engineer that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused

by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 1 Section "Project Management and Coordination."

- E. Surface and Substrate Preparation: Comply with manufacturer's recommendations for preparation of substrates to receive subsequent work.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Resident Engineer promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect and Resident Engineer when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Resident Engineer.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Resident Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect or Resident Engineer before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of **two** permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of **96 inches** in occupied spaces and **90 inches** in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produces harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. 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.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify

- Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.
 3. The Contractor shall be responsible for coordinating the support systems (mechanical, plumbing, electrical, data, structural, and radiation shielding) for the Medical Equipment, to be supplied by others. Due to the highly technical nature of the Medical Equipment, it is imperative the Contractor request, obtain and review the product information and installation requirements for each piece of equipment, prior to system rough-in. If the Equipment to be installed differs in manufacturer, model, or location from that shown on the construction drawings, the Contractor shall notify the Architect immediately. The rough-in work may not proceed until the Architect and the Design Team have reviewed the MP&E systems, structural support and radiation shielding for compatibility with the construction drawings.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg. F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Utilize containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 1 Section "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 1 Section "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- E. Manufacturer's Field Service: Comply with qualification requirements in Division 1 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

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SECTION 01 73 10
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Division 2 Section 02 41 00, DEMOLITION for demolition of selected portions of the building.
 - 2. Divisions 3 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - 3. Division 7 Section 07 84 00, FIRESTOPPING for patching fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Resident Engineer's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. LEED Requirements for Building Reuse:

1. Credit MR 1.1 [and 1.2]: Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be removed; do not cut such existing construction beyond indicated limits.
2. Credit MR 1.3: Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be removed; do not cut such existing construction beyond indicated limits.
3. Credit MR 1.2 [and 1.3]: Maintain existing nonshell, nonstructural components (walls, flooring, and ceilings) not indicated to be removed; do not cut such existing construction beyond indicated limits.

B. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load deflection ratio.

1. Foundation Construction.
2. Bearing and Retaining Walls.
3. Structural Concrete
4. Structural Steel
5. Structural Decking
6. Miscellaneous structural metals
7. Equipment Supports
8. Piping, ductwork, vessels and equipment.

C. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.

3. Fire-suppression systems.
 4. Mechanical systems piping and ducts.
 5. Control systems.
 6. Communication systems.
 7. Conveying systems.
 8. Electrical wiring systems.
 9. Operating systems of special construction in Division 13 Sections.
- D. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain-wall construction.
 4. Equipment supports.
 5. Piping, ductwork, vessels, and equipment.
 6. Noise- and vibration-control elements and systems.
- E. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- F. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
- B. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining

construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat

- over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

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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, 75% minimum, 95% preferred. 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, copper, 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.
 - 14. Fluorescent lamps.

1.2 RELATED WORK

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

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
1. Excess or unusable construction materials.
 2. Packaging used for construction products.
 3. Poor planning and/or layout.
 4. Construction error.
 5. Over ordering.
 6. Weather damage.
 7. Contamination.
 8. Mishandling.
 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of 75 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.cwm.wbdg.org> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

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

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

1.5 SUBMITTALS

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

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

1.6 APPLICABLE PUBLICATIONS

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

1.7 RECORDS

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 COLLECTION

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

3.2 DISPOSAL

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

3.3 REPORT

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

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SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Sections:
 - 1. Division 1 Section 01 00 00, GENERAL REQUIREMENTS for submitting final completion construction photographic documentation.
 - 2. Division 1 Section 01 00 00, GENERAL REQUIREMENTS for progress cleaning of Project site.
 - 3. Division 1 Section 01 78 00, PROJECT RECORD DOCUMENTS for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Division 1 Section 01 00 00, GENERAL REQUIREMENTS for operation, maintenance and instruction manual requirements.
 - 6. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic

- documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 8. Complete startup testing of systems.
 9. Submit test/adjust/balance records.
 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 11. Advise Owner of changeover in heat and other utilities.
 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 13. Complete final cleaning requirements, including touchup painting.
 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and/or Resident Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. If the Architect is unable to issue the certificate of substantial completion because the work is not considered to be substantially complete, the Contractor shall compensate for the Architect's services and expenses. Compensation shall be noted in the Supplementary General Conditions.
 2. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 3. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment.
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall

- state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and/or Resident Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Submit the following with request for inspection:
 - a. Previous inspection lists indicating completion of all items.
 - b. If any items cannot be completed, obtain prior approval of such delay.
 2. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.[Use CSI Form 14.1A.]
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect and/or Resident Engineer.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. PDF electronic file.

- b. Three paper copies of product schedule or list, unless otherwise indicated. Architect, will return two copies.

1.6 WARRANTIES

A. Warranty Requirements

1. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
4. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - a. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
5. Submittal: The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work, or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

B. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

C. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

- D. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 - 4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.
- E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

- o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Division 1 Section 01 50 00, TEMPORARY FACILITIES AND CONTROLS and Division 1 Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT

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SECTION 01 78 10
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 1 Section 01 77 00, CLOSEOUT PROCEDURES for general closeout procedures.
 - 2. Division 1 Section 01 00 00, GENERAL REQUIREMENTS for operation and maintenance manual requirements.
 - 3. Divisions 2 through 16 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies:
 - a. Submit **one** set of freshly-signed Record Prints, on mylar (per VA National CAD Standard Application Guide.
 - b. Submit **two** sets of Record Prints.
 - 2. The contractor shall submit the original hard-copy contractor-produced redlines from which the "as-built" Record Drawings were created.
 - 3. Electronic copy.
 - a. Two duplicate CDs each having complete as-built record drawing set in both PDF format and Autocad (must not be in Read Only status).
 - b. AutoCAD .DWG files must be bound (BIND Function in AutoCAD) before they are placed on the CD to eliminate x-ref errors and missing links within the drawings and individual layers.
- B. Record Specifications: Submit two copies of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit two copies of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
 3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Construction Manager's reference during normal working hours.

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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 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
- B. Section 01 81 09, TESTING FOR INDOOR AIR QUALITY (not written yet)
- C. Section 01 81 13.16, SUSTAINABLE DESIGN REQUIREMENTS - LEED FOR COMMERCIAL INTERIORS
- D. Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS

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.
- 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. Heat Island Effect:
 - a. Roofing Materials: Submittals for roofing materials must include manufacturer's cut sheets or product data highlighting the Solar Reflectance Index (SRI) of the material.
 - 2. 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.
3. 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, highlighting water consumption estimates, water use reduction measures, and corrosion inhibitors.
 4. 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).
 5. 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.
 6. Measurement and Verification Systems: Provide cut sheets and manufacturer's product data for all controls systems, highlighting electrical metering and trending capability components.
 7. 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.
 8. Recycled Content: Submittals for all materials with recycled content (excluding MEP systems equipment and components) must include the following documentation: Manufacturer's product data, product literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre-consumer recycled content (by weight) of each material or product
 - a. An electronic spreadsheet that tabulates the Project's total materials cost and combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value) expressed as a percentage of total materials cost. This spreadsheet shall be

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

9. 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.
10. 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.

11. 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.
12. 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
13. 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.
14. 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.
15. 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.
16. 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
17. 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.
18. 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
19. Mercury in Lighting: Provide manufacturer's cut sheets or product data for all fluorescent or HID lamps highlighting mercury content.
20. Lighting Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all lighting controls systems components.
21. Thermal Comfort Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all thermal comfort-control systems components.
22. 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
23. Gypsum Wall Board: Provide manufacturer's cut sheets or product data verifying that all gypsum wallboard products are moisture and mold-resistant.
24. Fiberglass Insulation: Provide manufacturer's cut sheets or product data verifying that fiberglass batt insulation contains no urea-formaldehyde.
25. 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.
26. 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:
1. Not more than 60 days after the Preconstruction Meeting, the General Contractor shall provide to the Owner 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.
- 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 Owner'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).
- 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.
- E. Commissioning: See Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS for submittal requirements.
- F. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports for the following:
 - 1. Construction Waste Management: Waste reduction progress reports and logs complying with the requirements of Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

2. Construction IAQ Management: See details below under Section 3.2 Construction Indoor Air Quality Management for Construction IAQ management progress report requirements.

1.6 QUALITY ASSURANCE

- A. Preconstruction Meeting: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner, 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.
- 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. 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
- G. 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

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

I. 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.

J. 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.

K. 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.
- L. Salvaged or Reused materials: There shall be no substitutions for specified salvaged and reused materials and products.
 1. Salvaged materials: Use of salvaged materials reduces impacts of disposal and manufacturing of replacements.
- M. Recycled Content of Materials:
 1. Provide building materials with recycled content such that post-consumer recycled content value plus half the pre-consumer recycled content value constitutes a minimum of 30% of the cost of materials used for the Project, exclusive of all MEP equipment, labor, and delivery costs. The Contractor shall make all attempts to maximize the procurement of materials with recycled content.
 - a. e post-consumer recycled content value of a material shall be determined by dividing the weight of post-consumer recycled content by the total weight of the material and multiplying by the cost of the material.
 - b. Do not include mechanical and electrical components in the calculations.
 - c. Do not include labor and delivery costs in the calculations.
 - d. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).
 - e. Utilize all on-site existing paving materials that are scheduled for demolition as granulated fill, and include the cost of this material had it been purchased in the calculations for recycled content value.
 - f. The materials in the following list must contain the minimum recycled content indicated:

Category	Minimum Recycled Content
Cast-in-Place Concrete	6% pre-consumer
Steel Reinforcing Bars	90% combined
Structural Steel Shapes	90% combined
Steel Joists	75% combined
Steel Deck	75% combined
Steel Fabrications	60% combined
Steel Studs	30% combined

Aluminum Fabrications	35% combined
Rigid Insulation (wall & roof)	20% pre-consumer
Batt insulation	30% combined
Gyp. Bd. Facing	100% post-consumer
Gyp. Bd. Gypsum Core	95% post-consumer
Acoustical Ceiling Tile	20% combined
Resilient Sheet Flooring	30% pre-consumer
Phenolic Lockers	5% pre-consumer, 10% post-consumer

N. 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 81 13.16
SUSTAINABLE DESIGN REQUIREMENTS - LEED FOR COMMERCIAL INTERIORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. All of the contract documents, including all of the plans and specifications, apply to this section (whether or not those documents specifically reference or identify the applicable green building goals and requirements).

1.2 SUMMARY

- A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Silver certification based on the USGBC's "LEED 2009 for Commercial Interiors."
 - 1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
 - 2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
 - 3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
 - 4. Specific requirements for LEED are also included in other Sections.
- B. The prerequisites and credits required to achieve the stated green building design goals may or may not be specifically identified in each area of the contract documents; however, compliance with the applicable green building design requirements will be utilized as part of the criteria for review and acceptance of submittals and substitution requests.

1.3 DEFINITIONS

- A. LEED: Leadership in Energy & Environmental Design.
- B. FSC: Forest Stewardship Council

- C. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
- D. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles (800 km) from Project site. Manufacturing refers to the final assembly of components into the building product that is installed at Project site.
- E. Regionally Extracted and Manufactured Materials: Regionally manufactured materials made from raw materials that are extracted, harvested, or recovered within a radius of 500 miles (800 km) from Project site.
- F. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

1.5 ACTION SUBMITTALS

- A. General: Submit additional LEED submittals required by other Specification Sections.

- B. 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.
- C. LEED Documentation Submittals:
1. Credit MR 2: Comply with Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
 2. Credit MR 4: Product data and certification letter from product manufacturers indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating material costs for each product having recycled content.
 3. Credit MR 5: Product data indicating location of material manufacturer for regionally manufactured materials. Include statement indicating cost for each regionally manufacturer material.
 - a. Include statement indicating distance from manufacturer to Project for each regionally manufactured material.
 4. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
 5. Credit IEQ 3.1:
 - a. Construction indoor-air-quality management plan.
 - b. Product data for temporary filtration media.
 - c. Product data for filtration media used during occupancy.
 - d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.
 6. Credit IEQ 3.2:
 - a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
 - b. Product data for filtration media used during flush-out and during occupancy.

- c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.
- 7. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
- 8. Credit IEQ 4.3: Product data documentation indicating compliance with testing and requirements of CRI's "Green Label Plus" program.
- 9. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
- 10. Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.
- 11. Credit IEQ 4.5: Product data for systems furniture and seating documenting compliance with Greenguard Indoor Air Quality.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
 - 1. Furniture.
 - 2. Plumbing.
 - 3. Mechanical.
 - 4. Electrical.
 - 5. Specialty items such as equipment.
- C. LEED Action Plans: Provide preliminary submittals within seven days of date established for the Notice to Proceed indicating how the following requirements will be met:
 - 1. Credit MR 2: Waste management plan complying with Section 017419 "Construction Waste Management and Disposal."
 - 2. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
 - 3. Credit MR 5: List of proposed regionally manufactured materials.
 - a. Identify each regionally manufactured material, including its source and cost.

4. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
 5. Credit IEQ 3.1: Construction indoor-air-quality management plan.
- D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
1. Credit MR 2: Waste reduction progress reports complying with Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
 2. Credit MR 4: Recycled content.
 3. Credit MR 5: Regionally manufactured materials.
 4. Credit MR 7: Certified wood products.

1.7 QUALITY ASSURANCE

- A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

- A. Credit MR 4: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of 20 percent of cost of materials used for Project.
1. Cost of post-consumer recycled content plus one-half of preconsumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
 2. Do not include plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.3 REGIONAL MATERIALS

- A. Credit MR 5, Option 1: Not less than 20 percent of materials (by cost) shall be regionally manufactured materials.

2.4 CERTIFIED WOOD

- A. Credit MR 7: Not less than 50 percent (by cost) of wood-based 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."
 - 1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products.
 - a. Rough carpentry.
 - b. Miscellaneous carpentry.
 - c. Architectural woodwork.
 - d. Wood paneling.
 - e. Wood veneer wall covering.
 - f. Wood flooring.
 - g. Furniture.

2.3 LOW-EMITTING MATERIALS

- A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Subfloor Adhesives: 50 g/L.
 - 3. Metal-to-Metal Adhesives: 30 g/L.
 - 4. Adhesives for Porous Materials (Except Wood): 50 g/L.
 - 5. Plastic Foam Adhesives: 50 g/L.
 - 6. Carpet Adhesives: 50 g/L.
 - 7. Carpet Pad Adhesives: 50 g/L.
 - 8. VCT and Asphalt Tile Adhesives: 50 g/L.
 - 9. Cove Base Adhesives: 50 g/L.
 - 10. Gypsum Board and Panel Adhesives: 50 g/L.
 - 11. Ceramic Tile Adhesives: 65 g/L.
 - 12. Multipurpose Construction Adhesives: 70 g/L.
 - 13. Contact Adhesive: 80 g/L.
 - 14. Structural Glazing Adhesives: 100 g/L.
 - 15. Single-Ply Roof Membrane Adhesive: 250 g/L.

16. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface):250 g/L.
 17. Plastic Cement Welding Compounds: 250 g/L.
 18. ABS Welding Compounds: 325 g/L.
 19. CPVC Welding Compounds: 490 g/L.
 20. PVC Welding Compounds: 510 g/L.
 21. Adhesive Primer for Plastic: 550 g/L.
 22. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
 23. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
 24. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
 25. Other Adhesives: 250 g/L.
 26. Architectural Sealants: 250 g/L.
 27. Single-Ply Roof Membrane Sealants: 450 g/L.
 28. Other Sealants: 420 g/L.
 29. Other Sealant Primers: 750 g/L.
- B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: VOC not more than 50 g/L.
 2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
 3. Dry-Fog Coatings: VOC not more than 400 g/L.
 4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
 7. Pretreatment Wash Primers: VOC not more than 420 g/L.
 8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
 9. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
 10. Shellacs, Clear: VOC not more than 730 g/L.
 11. Shellacs, Pigmented: VOC not more than 550 g/L.
 12. Stains: VOC not more than 250 g/L.
 13. Floor Coatings: VOC not more than 100 g/L.
- C. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

- A. Credit MR 2: Comply with Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

3.2 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

- A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 01 50 00, TEMPORARY FACILITIES AND CONTROLS, install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy.
3. Air-Quality Testing:
 - a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "LEED Reference Guide for Green Interior Design and Construction."
 - b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
 - 1) Particulates (PM10): 50 micrograms/cu. m.
 - 2) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
 - c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.
 - d. Air-sample testing shall be conducted as follows:
 - 1) All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
 - 2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and

acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.

- 3) Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. (2,300 sq. m.) or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
- 4) Air samples shall be collected between 3 and 6 feet (0.9 and 1.8 m) from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

----- END -----

SECTION 01 91 00
GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 COMMISSIONING DESCRIPTION

- A. This Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS shall form the basis of the construction phase commissioning process and procedures. The Commissioning Agent shall add, modify, and refine the commissioning procedures, as approved by the Department of Veterans Affairs (VA), to suit field conditions and actual manufacturer's equipment, incorporate test data and procedure results, and provide detailed scheduling for all commissioning tasks.
- B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the Division 7, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of these specifications are intended to be provided in coordination with the commissioning services and are not intended to duplicate services. The Contractor shall coordinate the work required by individual specification sections with the commissioning services requirements specified herein.
- C. Where individual testing, adjusting, or related services are required in the project specifications and not specifically required by this commissioning requirements specification, the specified services shall be provided and copies of documentation, as required by those specifications shall be submitted to the VA and the Commissioning Agent to be indexed for future reference.
- D. Where training or educational services for VA are required and specified in other sections of the specifications, including but not limited to Division 7, Division 8, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of the specification, these services are intended to be provided in addition to the training and educational services specified herein.
- E. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the VA's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing

and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:

1. Verify that the applicable equipment and systems are installed in accordance with the 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.

1.2 CONTRACTUAL RELATIONSHIPS

- A. For this construction project, the Department of Veterans Affairs contracts with a Contractor to provide construction services. The contracts are administered by the VA Contracting Officer and the Resident Engineer as the designated representative of the Contracting Officer. On this project, the authority to modify the contract in any way is strictly limited to the authority of the Contracting Officer.
- B. In this project, only two contract parties are recognized and communications on contractual issues are strictly limited to VA Resident Engineer and the Contractor. It is the practice of the VA to require that communications between other parties to the contracts (Subcontractors and Vendors) be conducted through the Resident Engineer and Contractor. It is also the practice of the VA that communications between other parties of the project (Commissioning Agent and Architect/Engineer) be conducted through the Resident Engineer.
- C. Whole Building Commissioning is a process that relies upon frequent and direct communications, as well as collaboration between all parties to the construction process. By its nature, a high level of communication

and cooperation between the Commissioning Agent and all other parties (Architects, Engineers, Subcontractors, Vendors, third party testing agencies, etc.) is essential to the success of the Commissioning effort.

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

1. No communications (verbal or written) from the Commissioning Agent shall be deemed to constitute direction that modifies the terms of any contract between the Department of Veterans Affairs and the Contractor.
2. Commissioning Issues identified by the Commissioning Agent will be delivered to the Resident Engineer 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 Resident Engineer to require either an official interpretation of the construction documents or require a modification of the contract documents, the Contracting Officer or Resident Engineer will issue an official directive to this effect.
4. All parties to the Commissioning Process shall be individually responsible for alerting the Resident Engineer 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 Resident Engineer, with appropriate technical guidance from the Architect/Engineer and/or Commissioning Agent.

1.3 RELATED WORK

A. Section 01 00 00 GENERAL REQUIREMENTS.

- B. Section 01 32.16.15 PROJECT SCHEDULES (SMALL PROJECTS - DESIGN/BID/BUILD)
- C. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
- D. Section 01 81 11 SUSTAINABLE DESIGN REQUIREMENTS
- 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.
- B. The commissioning activities have been developed to support the VA requirements to meet guidelines for Federal Leadership in Environmental, Energy, and Economic Performance.
- C. The commissioning activities have been developed to support the United States Green Building Council's (USGBC) LEED™ rating program and to support delivery of project performance in accordance with the VA requirements developed for the project to support the following credits:
 - 1. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" and the prerequisite of "Fundamental Building Systems Commissioning."
 - 2. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" requirements for the "Enhanced Building System Commissioning" credit.
 - 3. Activities and documentation for the LEED™ section on "Measurement and Verification" requirements for the Measurement and Verification credit.

1.5 ACRONYMS

List of Acronyms	
Acronym	Meaning
A/E	Architect / Engineer Design Team
AHJ	Authority Having Jurisdiction
ASHRAE	Association Society for Heating Air Condition and Refrigeration Engineers

List of Acronyms	
Acronym	Meaning
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
VA CFM	VA Office of Construction and Facilities Management
VACO	VA Central Office
VA PM	VA Project Manager
VA-RE	VA Resident Engineer

List of Acronyms	
Acronym	Meaning
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:
1. All systems listed under LEED for Commercial Interiors Project Checklist-Silver. See Exhibit for LEED Credit Checklist.
 2. All equipment of heating, ventilating and air conditioning systems both mechanical and plumbing, and direct digital controls.
 3. Life safety systems (smoke and fire alarm, fire suppression, fire/smoke dampers, sliding doors)
 4. New Domestic water distribution
 5. Emergency Power Systems: including Emergency Lighting
 6. All electrical and lighting control systems, including but not limited to electrical distribution system, normal power, emergency power, grounding/bonding, electrical monitoring, substations, lighting control systems.
 7. Public Address System
 8. Noise and vibration control
 9. Data and Communication:
 - a. TV/cable
 - b. Ground/bonding
 - c. Security, Access Control System, Video surveillance

1.8 COMMISSIONING TEAM

- A. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, schedulers, suppliers, and specialists deemed appropriate by the Department of Veterans Affairs (VA) and Commissioning Agent.
- B. Members Appointed by Contractor:
1. Contractor' Commissioning Manager: The designated person, company, or entity that plans, schedules and coordinates the commissioning activities for the construction team.
 2. Contractor's Commissioning Representative(s): Individual(s), each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.
- C. Members Appointed by VA:
1. Commissioning Agent: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. The VA will engage the CxA under a separate contract.

2. User: Representatives of the facility user and operation and maintenance personnel.
3. A/E: Representative of the Architect and engineering design professionals.

1.9 VA'S COMMISSIONING RESPONSIBILITIES

- A. Appoint an individual, company or firm to act as the Commissioning Agent.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
 1. Coordination meetings.
 2. Training in operation and maintenance of systems, subsystems, and equipment.
 3. Testing meetings.
 4. Witness and assist in Systems Functional Performance Testing.
 5. Demonstration of operation of systems, subsystems, and equipment.
- C. Provide the Construction Documents, prepared by Architect and approved by VA, to the Commissioning Agent and for use in managing the commissioning process, developing the commissioning plan, systems manuals, and reviewing the operation and maintenance training plan.

1.10 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES

- A. The Contractor shall assign a Commissioning Manager to manage commissioning activities of the Contractor, and subcontractors.
- B. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.
- C. The Contractor shall ensure that each installing subcontractor shall assign representatives with expertise and authority to act on behalf of the subcontractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 1. Participate in commissioning coordination meetings.
 2. Conduct operation and maintenance training sessions in accordance with approved training plans.
 3. Verify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.

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

1.11 COMMISSIONING AGENT'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Prepare the commissioning plan. See Paragraph 1.12-A of this specification Section for further information.
- C. Review and comment on selected submittals from the Contractor for general conformance with the Construction Documents. Review and comment on the ability to test and operate the system and/or equipment, including providing gages, controls and other components required to operate, maintain, and test the system. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the Construction Documents.
- D. At the beginning of the construction phase, conduct an initial construction phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; Pre-Functional Checklists, Systems Functional Performance Testing; and project completion.
- E. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss status of the

commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The Commissioning Agent shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.

- F. Observe construction and report progress, observations and issues. Observe systems and equipment installation for adequate accessibility for maintenance and component replacement or repair, and for general conformance with the Construction Documents.
- G. Prepare Project specific Pre-Functional Checklists and Systems Functional Performance Test procedures.
- H. Coordinate Systems Functional Performance Testing schedule with the Contractor.
- I. Witness selected systems startups.
- J. Verify selected Pre-Functional Checklists completed and submitted by the Contractor.
- K. Review and spot check the results of the TAB report.
- L. Witness and document Systems Functional Performance Testing.
- M. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
- N. 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.
- O. Review operation and maintenance training program developed by the Contractor. Verify training plans provide qualified instructors to conduct operation and maintenance training.
- P. Prepare commissioning Field Observation Reports.
- Q. Prepare the Final Commissioning Report.
- R. 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.

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

1.12 COMMISSIONING DOCUMENTATION

- A. Commissioning Plan: A document, prepared by Commissioning Agent, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited, to the following:
1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
 2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
 3. Identification of systems and equipment to be commissioned.
 4. Schedule of Commissioning Coordination meetings.
 5. Identification of items that must be completed before the next operation can proceed.
 6. Description of responsibilities of commissioning team members.
 7. Description of observations to be made.
 8. Description of requirements for operation and maintenance training.
 9. Schedule for commissioning activities with dates coordinated with overall construction schedule.
 10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
 11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
 12. Preliminary Systems Functional Performance Test procedures.
- B. Systems Functional Performance Test Procedures: The Commissioning Agent will develop Systems Functional Performance Test Procedures for each system to be commissioned, including subsystems, or equipment and interfaces or interlocks with other systems. Systems Functional Performance Test Procedures will include a separate entry, with space

for comments, for each item to be tested. Preliminary Systems Functional Performance Test Procedures will be provided to the VA, Architect/Engineer, and Contractor for review and comment. The Systems Performance Test Procedure will include test procedures for each mode of operation and provide space to indicate whether the mode under test responded as required. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:

1. Name and identification code of tested system.
 2. Test number.
 3. Time and date of test.
 4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 5. Dated signatures of the person performing test and of the witness, if applicable.
 6. Individuals present for test.
 7. Observations and Issues.
 8. Issue number, if any, generated as the result of test.
- C. Pre-Functional Checklists: The Commissioning Agent will prepare Pre-Functional Checklists. Pre-Functional Checklists shall be completed and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will spot check Pre-Functional Checklists to verify accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.
- D. Test and Inspection Reports: The Commissioning Agent will record test data, observations, and measurements on Systems Functional Performance Test Procedure. The report will also include recommendation for system acceptance or non-acceptance. Photographs, forms, and other means appropriate for the application shall be included with data. Commissioning Agent Will compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.
- E. Corrective Action Documents: The Commissioning Agent will document corrective action taken for systems and equipment that fail tests. The documentation will include any required modifications to systems and equipment and/or revisions to test procedures, if any. The

Commissioning Agent will witness and document any retesting of systems and/or equipment requiring corrective action and document retest results.

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

1. Creating an Commissioning Issues Log Entry:

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

2. Documenting Issue Resolution:

- a. Log date correction is completed or the issue is resolved.
- b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
- c. Identify changes to the Contract Documents that may require action.

- d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
 - e. Identify person(s) who corrected or resolved the issue.
 - f. Identify person(s) verifying the issue resolution.
- G. Final Commissioning Report: The Commissioning Agent will document results of the commissioning process, including unresolved issues, and performance of systems, subsystems, and equipment. The Commissioning Report will indicate whether systems, subsystems, and equipment have been properly installed and are performing according to the Contract Documents. This report will be used by the Department of Veterans Affairs when determining that systems will be accepted. This report will be used to evaluate systems, subsystems, and equipment and will serve as a future reference document during VA occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents and those that do not meet requirements of the Contract Documents. The commissioning report will include, but is not limited to, the following:
- 1. Lists and explanations of substitutions; compromises; variances with the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. Design Narrative documentation maintained by the Commissioning Agent.
 - 2. Commissioning plan.
 - 3. Pre-Functional Checklists completed by the Contractor, with annotation of the Commissioning Agent review and spot check.
 - 4. Systems Functional Performance Test Procedures, with annotation of test results and test completion.
 - 5. Commissioning Issues Log.
 - 6. Listing of deferred and off season test(s) not performed, including the schedule for their completion.
- H. Addendum to Final Commissioning Report: The Commissioning Agent will prepare an Addendum to the Final Commissioning Report near the end of the Warranty Period. The Addendum will indicate whether systems, subsystems, and equipment are complete and continue to perform according to the Contract Documents. The Addendum to the Final Commissioning Report shall include, but is not limited to, the following:
- 1. Documentation of deferred and off season test(s) results.

2. Completed Systems Functional Performance Test Procedures for off season test(s).
 3. Documentation that unresolved system performance issues have been resolved.
 4. Updated Commissioning Issues Log, including status of unresolved issues.
 5. Identification of potential Warranty Claims to be corrected by the Contractor.
- I. Systems Manual: The Commissioning Agent will gather required information and compile the Systems Manual. The Systems Manual will include, but is not limited to, the following:
1. Design Narrative, including system narratives, schematics, single-line diagrams, flow diagrams, equipment schedules, and changes made throughout the Project.
 2. Reference to Final Commissioning Plan.
 3. Reference to Final Commissioning Report.
 4. Approved Operation and Maintenance Data as submitted by the Contractor.

1.13 SUBMITTALS

- A. Preliminary Commissioning Plan Submittal: The Commissioning Agent has prepared a Preliminary Commissioning Plan based on the final Construction Documents. The Preliminary Commissioning Plan is included as an Appendix to this specification section. The Preliminary Commissioning Plan is provided for information only. It contains preliminary information about the following commissioning activities:
1. The Commissioning Team: A list of commissioning team members by organization.
 2. Systems to be commissioned. A detailed list of systems to be commissioned for the project. This list also provides preliminary information on systems/equipment submittals to be reviewed by the Commissioning Agent; preliminary information on Pre-Functional Checklists that are to be completed; preliminary information on Systems Performance Testing, including information on testing sample size (where authorized by the VA).
 3. Commissioning Team Roles and Responsibilities: Preliminary roles and responsibilities for each Commissioning Team member.

4. Commissioning Documents: A preliminary list of commissioning-related documents, include identification of the parties responsible for preparation, review, approval, and action on each document.
 5. Commissioning Activities Schedule: Identification of Commissioning Activities, including Systems Functional Testing, the expected duration and predecessors for the activity.
 6. Pre-Functional Checklists: Preliminary Pre-Functional Checklists for equipment, components, subsystems, and systems to be commissioned. These Preliminary Pre-Functional Checklists provide guidance on the level of detailed information the Contractor shall include on the final submission.
 7. Systems Functional Performance Test Procedures: Preliminary step-by-step System Functional Performance Test Procedures to be used during Systems Functional Performance Testing. These Preliminary Systems Functional Performance procedures provide information on the level of testing rigor, and the level of Contractor support required during performance of system's testing.
- B. Final Commissioning Plan Submittal: Based on the Final Construction Documents and the Contractor's project team, the Commissioning Agent will prepare the Final Commissioning Plan as described in this section. The Commissioning Agent will submit three hard copies and three sets of electronic files of Final Commissioning Plan. The Contractor shall review the Commissioning Plan and provide any comments to the VA. The Commissioning Agent will incorporate review comments into the Final Commissioning Plan as directed by the VA.
- C. Systems Functional Performance Test Procedure: The Commissioning Agent will submit preliminary Systems Functional Performance Test Procedures to the Contractor, and the VA for review and comment. The Contractor shall return review comments to the VA and the Commissioning Agent. The VA will also return review comments to the Commissioning Agent. The Commissioning Agent will incorporate review comments into the Final Systems Functional Test Procedures to be used in Systems Functional Performance Testing.
- D. Pre-Functional Checklists: The Commissioning Agent will submit Pre-Functional Checklists to be completed by the Contractor.
- E. Test and Inspection Reports: The Commissioning Agent will submit test and inspection reports to the VA with copies to the Contractor and the Architect/Engineer.

- F. Corrective Action Documents: The Commissioning Agent will submit corrective action documents to the VA Resident Engineer 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 XX 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 XX days of contract award, the Contractor shall ensure that each subcontractor designates specific individuals as Commissioning Representatives (CXR) to be responsible for commissioning related tasks. The Contractor shall ensure the designated Commissioning

Representatives participate in the commissioning process as team members providing commissioning testing services, equipment operation, adjustments, and corrections if necessary. The Contractor shall ensure that all Commissioning Representatives shall have sufficient authority to direct their respective staff to provide the services required, and to speak on behalf of their organizations in all commissioning related contractual matters.

1.15 QUALITY ASSURANCE

- A. Instructor Qualifications: Factory authorized service representatives shall be experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
- B. Test Equipment Calibration: The Contractor shall comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.16 COORDINATION

- A. Management: The Commissioning Agent will coordinate the commissioning activities with the VA and Contractor. The Commissioning Agent will submit commissioning documents and information to the VA. All commissioning team members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- B. Scheduling: The Contractor shall work with the Commissioning Agent and the VA to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks, durations and predecessors) on commissioning activities to allow the Contractor and the VA to schedule commissioning activities. All parties shall address scheduling issues and make necessary notifications in a timely manner in order to expedite the project and the commissioning process. The Contractor shall update the Master Construction as directed by the VA.
- C. Initial Schedule of Commissioning Events: The Commissioning Agent will provide the initial schedule of primary commissioning events in the Commissioning Plan and at the commissioning coordination meetings. The Commissioning Plan will provide a format for this schedule. As

construction progresses, more detailed schedules will be developed by the Contractor with information from the Commissioning Agent.

- D. Commissioning Coordinating Meetings: The Commissioning Agent will conduct periodic Commissioning Coordination Meetings of the commissioning team to review status of commissioning activities, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
- E. Pretesting Meetings: The Commissioning Agent will conduct pretest meetings of the commissioning team to review startup reports, Pre-Functional Checklist results, Systems Functional Performance Testing procedures, testing personnel and instrumentation requirements.
- F. Systems Functional Performance Testing Coordination: The Contractor shall coordinate testing activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. The Contractor shall coordinate the schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. The Contractor shall provide all standard and specialized testing equipment required to perform Systems Functional Performance Testing. Test equipment required for Systems Functional Performance Testing will be identified in the detailed System Functional Performance Test Procedure prepared by the Commissioning Agent.
- B. Data logging equipment and software required to test equipment shall be provided by the Contractor.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5 °C (1.0 °F) and a resolution of + or - 0.1 °C (0.2 °F). Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES

- A. All members of the commissioning team shall fulfill the responsibilities listed in 1.9, 1.10, 1.11 and/or the Commissioning Plan. Deviations from either shall be discussed at regularly held commissioning meetings, with the approval of the VA
- B. The Commissioning Plan shall overview all tasks and responsibilities. The CxA shall provide direction in the Cx process and coordinate with all members of the commissioning team to ensure all individual responsibilities are fulfilled.

3.2 STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS

- A. The following procedures shall apply to all equipment and systems to be commissioned, according to Part 1, Systems to Be Commissioned.
 - 1. Pre-Functional Checklists are important to ensure that the equipment and systems are hooked up and operational. These ensure that Systems Functional Performance Testing may proceed without unnecessary delays. Each system to be commissioned shall have a full Pre-Functional Checklist completed by the Contractor prior to Systems Functional Performance Testing. No sampling strategies are used.
 - a. The Pre-Functional Checklist will identify the trades responsible for completing the checklist. The Contractor shall ensure the appropriate trades complete the checklists.
 - b. The Commissioning Agent will review completed Pre-Functional Checklists and field-verify the accuracy of the completed checklist using sampling techniques.
 - 2. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.
 - a. The Contractor shall develop the full startup plan by combining (or adding to) the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections

- of each procedure and a summary statement with a signature block at the end of the plan.
 - b. The full startup plan shall at a minimum consist of the following items:
 - 1) The Pre-Functional Checklists.
 - 2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
 - 3) The manufacturer's normally used field checkout sheets.
 - c. The Contractor will submit the full startup plan to the VA and Commissioning Agent for review. Final approval will be by the VA.
3. Sensor and Actuator Calibration
- a. All field installed temperature, relative humidity, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 21, Division 22, Division 23, Division 26, Division 27, and Division 28 specifications.
 - b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
4. Execution of Equipment Startup
- a. Four weeks prior to equipment startup, the Contractor shall schedule startup and checkout with the VA and Commissioning Agent. The performance of the startup and checkout shall be directed and executed by the Contractor.
 - b. The Commissioning Agent will observe the startup procedures for selected pieces of primary equipment.
 - c. The Contractor shall execute startup and provide the VA and Commissioning Agent with a signed and dated copy of the completed startup checklists, and contractor tests.
 - d. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

3.3 DEFICIENCIES, NONCONFORMANCE, AND APPROVAL IN CHECKLISTS AND STARTUP

- A. The Contractor shall clearly list any outstanding items of the initial startup and Pre-Functional Checklist procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be provided to the VA and the Commissioning Agent within two days of completion.
- B. The Commissioning Agent will review the report and submit comments to the VA. The Commissioning Agent will work with the Contractor to correct and verify deficiencies or uncompleted items. The Commissioning Agent will involve the VA and others as necessary. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the VA and Commissioning Agent as soon as outstanding items have been corrected. The Contractor shall submit an updated startup report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the Commissioning Agent will recommend approval of the checklists and startup of each system to the VA.
- C. The Contractor shall be responsible for resolution of deficiencies as directed the VA.

3.4 PHASED COMMISSIONING

- A. The project may require startup and initial checkout to be executed in phases. This phasing shall be planned and scheduled in a coordination meeting of the VA, Commissioning Agent, and the Contractor. Results will be added to the master construction schedule and the commissioning schedule.

3.5 DDC SYSTEM TRENDING FOR COMMISSIONING

- A. Trending is a method of testing as a standalone method or to augment manual testing. The Contractor shall trend any and all points of the system or systems at intervals specified below.
- B. Alarms are a means to notify the system operator that abnormal conditions are present in the system. Alarms shall be structured into three tiers - Critical, Priority, and Maintenance.
 - 1. Critical alarms are intended to be alarms that require the immediate attention of and action by the Operator. These alarms shall be displayed on the Operator Workstation in a popup style window that is graphically linked to the associated unit's graphical display.

- The popup style window shall be displayed on top of any active window within the screen, including non DDC system software.
2. Priority level alarms are to be printed to a printer which is connected to the Operator's Work Station located within the engineer's office. Additionally Priority level alarms shall be able to be monitored and viewed through an active alarm application. Priority level alarms are alarms which shall require reaction from the operator or maintenance personnel within a normal work shift, and not immediate action.
 3. Maintenance alarms are intended to be minor issues which would require examination by maintenance personnel within the following shift. These alarms shall be generated in a scheduled report automatically by the DDC system at the start of each shift. The generated maintenance report will be printed to a printer located within the engineer's office.
- C. The Contractor shall provide a wireless internet network in the building for use during controls programming, checkout, and commissioning. This network will allow project team members to more effectively program, view, manipulate and test control devices while being in the same room as the controlled device.
- D. The Contractor shall provide graphical trending through the DDC control system of systems being commissioned. Trending requirements are indicated below and included with the Systems Functional Performance Test Procedures. Trending shall occur before, during and after Systems Functional Performance Testing. The Contractor shall be responsible for producing graphical representations of the trended DDC points that show each system operating properly during steady state conditions as well as during the System Functional Testing. These graphical reports shall be submitted to the Resident Engineer 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 Resident Engineer. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the Resident Engineer, prior to the execution of Systems Functional Performance Testing.
2. Dynamic plotting - The Contractor shall also provide dynamic plotting during Systems Functional Performance testing at frequent intervals for points determined by the Systems Functional Performance Test Procedure. The graphical plots will be formatted and plotted at durations listed in the Systems Functional Performance Test Procedure.
 3. Graphical plotting - The graphical plots shall be provided with a dual y-axis allowing 15 or more trend points (series) plotted simultaneously on the graph with each series in distinct color. The plots will further require title, axis naming, legend etc. all described by the Systems Functional Performance Test Procedure. If this cannot be sufficiently accomplished directly in the Direct Digital Control System then it is the responsibility of the Contractor to plot these trend logs in Microsoft Excel.
 4. The following tables indicate the points to be trended and alarmed by system. The Operational Trend Duration column indicates the trend duration for normal operations. The Testing Trend Duration column indicates the trend duration prior to Systems Functional Performance Testing and again after Systems Functional Performance Testing. The Type column indicates point type: AI = Analog Input, AO = Analog Output, DI = Digital Input, DO = Digital Output, Calc = Calculated Point. In the Trend Interval Column, COV = Change of Value. The Alarm Type indicates the alarm priority; C = Critical, P = Priority, and M = Maintenance. The Alarm Range column indicates when the point is considered in the alarm state. The Alarm Delay column indicates the length of time the point must remain in an alarm state before the alarm is recorded in the DDC. The intent is to allow minor, short-duration events to be corrected by the DDC system prior to recording an alarm.

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
OA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Humidity	AI	15 Min	24 hours	3 days	P	>60% RH	10 min
Mixed Air Temp	AI	None	None	None	N/A		
SA Temp	AI	15 Min	24 hours	3 days	C	±5°F from SP	10 min
Supply Fan Speed	AI	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AI	15 Min	24 hours	3 days	N/A		
RA Pre-Filter Status	AI	None	None	None	N/A		
OA Pre-Filter Status	AI	None	None	None	N/A		
After Filter Status	AI	None	None	None	N/A		
SA Flow	AI	15 Min	24 hours	3 days	C	±10% from SP	10 min
OA Supply Temp	AI	15 Min	24 hours	3 days	P	±5°F from SP	10 min
RA Supply Temp	AI	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
RA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
Initial UVC Intensity (%)	AI	None	None	None	N/A		
Duct Pressure	AI	15 Min	24 hours	3 days	C	±25% from SP	6 min
CO2 Level	AI	15 Min	24 hours	3 days	P	±10% from SP	10 min
Supply Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Return Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 Min

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
High Static Status	DI	COV	24 hours	3 days	P	True	1 min
Fire Alarm Status	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 1	DI	COV	24 hours	3 days	C	True	10 min
Freeze Stat Level 2	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 3	DI	COV	24 hours	3 days	P	True	1 min
Fire/Smoke Damper Status	DI	COV	24 hours	3 days	P	Closed	1 min
Emergency AHU Shutdown	DI	COV	24 hours	3 days	P	True	1 min
Exhaust Fan #1 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #2 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #3 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
OA Alarm	DI	COV	24 hours	3 days	C	True	10 min
High Static Alarm	DI	COV	24 hours	3 days	C	True	10 min
UVC Emitter Alarm	DI	COV	24 hours	3 days	P	True	10 min
CO2 Alarm	DI	COV	24 hours	3 days	P	True	10 min
Power Failure	DI	COV	24 hours	3 days	P	True	1 min
Supply Fan Speed	AO	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AO	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AO	15 Min	24 hours	3 days	N/A		
Supply Fan S/S	DO	COV	24 hours	3 days	N/A		
Return Fan S/S	DO	COV	24 hours	3 days	N/A		

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Fire/Smoke Dampers	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
AHU Energy	Calc	1 Hour	30 day	N/A	N/A		

Terminal Unit (VAV, CAV, etc.) Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
Air Flow	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
SA Temperature	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
Local Setpoint	AI	15 Min	12 hours	3 days	M	±10°F from SP	60 min
Space Humidity	AI	15 Min	12 hours	3 days	P	> 60% RH	5 min
Unoccupied Override	DI	COV	12 hours	3 days	M	N/A	12 Hours
Refrigerator Alarm	DI	COV	12 hours	3 days	C	N/A	10 min
Damper Position	AO	15 Minutes	12 hours	3 days	N/A		
Heating coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		

Chilled Water System Trending and Alarms
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Ward 2C Remodel: Intensive Care Unit
VA Project Number 654-412

Point	Type	Trend Interval	Operationa l Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 1 Entering Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Leaving Temperature	AI	15 Minutes	12 Hours	3 days	P	±5°F from SP	10 Min
Chiller 1 Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Percent Load	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 KW Consumption	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Entering Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Leaving Temperature	AI	15 Minutes	12 Hours	3 days	P	±5°F from SP	10 Min
Chiller 2 Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Percent Load	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 KW Consumption	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Decoupler Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Supply Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Primary Loop Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 1 Evaporator Iso-Valve	DI	COV	12 Hours	3 days	N/A		

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 1 Evaporator Flow Switch	DI	COV	12 Hours	3 days	N/A		
Chiller 1 Unit Alarm	DI	COV	12 Hours	3 days	C	True	10 Min
Chiller 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 2 Evaporator Iso-Valve	DI	COV	12 Hours	3 days	N/A		
Chiller 2 Evaporator Flow Switch	DI	COV	12 Hours	3 days	N/A		
Chiller 2 Unit Alarm	DI	COV	12 Hours	3 days	C	True	10 Min
Primary Loop Pump 1 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Pump 2 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Primary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Primary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Enable	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Iso-Valve Command	DO	COV	12 Hours	3 days	N/A		
Chiller 2 Enable	DO	COV	12 Hours	3 days	N/A		
Chiller 2 Iso-Valve Command	DO	COV	12 Hours	3 days	N/A		

E. The Contractor shall provide the following information prior to Systems Functional Performance Testing. Any documentation that is modified after submission shall be recorded and resubmitted to the Resident Engineer and Commissioning Agent.

1. Point-to-Point checkout documentation;
2. Sensor field calibration documentation including system name, sensor/point name, measured value, DDC value, and Correction Factor.
3. A sensor calibration table listing the referencing the location of procedures to following in the O&M manuals, and the frequency at which calibration should be performed for all sensors, separated by system, subsystem, and type. The calibration requirements shall be submitted both in the O&M manuals and separately in a standalone document containing all sensors for inclusion in the commissioning documentation. The following table is a sample that can be used as a template for submission.

SYSTEM		
Sensor	Calibration Frequency	O&M Calibration Procedure Reference
Discharge air temperature	Once a year	Volume I Section D.3.aa
Discharge static pressure	Every 6 months	Volume II Section A.1.c

4. Loop tuning documentation and constants for each loop of the building systems. The documentation shall be submitted in outline or table separated by system, control type (e.g. heating valve temperature control); proportional, integral and derivative constants, interval (and bias if used) for each loop. The following table is a sample that can be used as a template for submission.

AIR HANDLING UNIT AHU-1				
Control Reference	Proportional Constant	Integral Constant	Derivative Constant	Interval
Heating Valve Output	1000	20	10	2 sec.

3.6 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

- A. This paragraph applies to Systems Functional Performance Testing of systems for all referenced specification Divisions.
- B. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to the Contract Documents. Systems Functional Performance Testing

facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of noncompliant performance are identified and corrected, thereby improving the operation and functioning of the systems. In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, fire alarm and emergency power) where there is a specified system response. The Contractor shall verify each sequence in the sequences of operation. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

- C. Development of Systems Functional Performance Test Procedures: Before Systems Functional Performance Test procedures are written, the Contractor shall submit all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements found in the Contract Documents and approved submittals and shop drawings, the Commissioning Agent will develop specific Systems Functional Test Procedures to verify and document proper operation of each piece of equipment and system to be commissioned. The Contractor shall assist the Commissioning Agent in developing the Systems Functional Performance Test procedures as requested by the Commissioning Agent i.e. by answering questions about equipment, operation, sequences, etc. Prior to execution, the Commissioning Agent will provide a copy of the Systems Functional Performance Test procedures to the VA, the Architect/Engineer, and the Contractor, who shall review the tests for feasibility, safety, equipment and warranty protection.
- D. Purpose of Test Procedures: The purpose of each specific Systems Functional Performance Test is to verify and document compliance with the stated criteria of acceptance given on the test form. Representative test formats and examples are found in the Commissioning Plan for this project. (The Commissioning Plan is issued as a separate document and is available for review.) The test procedure forms developed by the Commissioning Agent will include, but not be limited to, the following information:
1. System and equipment or component name(s)
 2. Equipment location and ID number

3. Unique test ID number, and reference to unique Pre-Functional Checklists and startup documentation, and ID numbers for the piece of equipment
 4. Date
 5. Project name
 6. Participating parties
 7. A copy of the specification section describing the test requirements
 8. A copy of the specific sequence of operations or other specified parameters being verified
 9. Formulas used in any calculations
 10. Required pretest field measurements
 11. Instructions for setting up the test.
 12. Special cautions, alarm limits, etc.
 13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
 14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
 15. A section for comments.
 16. Signatures and date block for the Commissioning Agent. A place for the Contractor to initial to signify attendance at the test.
- E. Test Methods: Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.
1. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.
 2. Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable.

- e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
3. Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
 4. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.
 5. Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.
- F. Setup: Each function and test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The Contractor shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pretest condition.
- G. Sampling: No sampling is allowed in completing Pre-Functional Checklists. Sampling is allowed for Systems Functional Performance Test Procedures execution. The Commissioning Agent will determine the sampling rate. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the Commissioning Agent may stop the testing and require the Contractor to perform and document a checkout of the remaining units, prior to

continuing with Systems Functional Performance Testing of the remaining units.

- H. Cost of Retesting: The cost associated with expanded sample System Functional Performance Tests shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- I. Coordination and Scheduling: The Contractor shall provide a minimum of 7 days' notice to the Commissioning Agent and the VA regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Commissioning Agent will schedule Systems Functional Performance Tests with the Contractor and VA. The Commissioning Agent will witness and document the Systems Functional Performance Testing of systems. The Contractor shall execute the tests in accordance with the Systems Functional Performance Test Procedure.
- J. Testing Prerequisites: In general, Systems Functional Performance Testing will be conducted only after Pre-Functional Checklists have been satisfactorily completed. The control system shall be sufficiently tested and approved by the Commissioning Agent and the VA before it is used to verify performance of other components or systems. The air balancing and water balancing shall be completed before Systems Functional Performance Testing of air-related or water-related equipment or systems are scheduled. Systems Functional Performance Testing will proceed from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems will be checked.
- K. Problem Solving: The Commissioning Agent will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

3.7 DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS

- A. Documentation: The Commissioning Agent will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the Commissioning Agent for that purpose. Prior to testing, the Commissioning Agent will provide these forms to the VA and the Contractor for review and approval. The Contractor shall include the filled out forms with the O&M manual data.

- B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported to the VA on Commissioning Field Reports and/or the Commissioning Master Issues Log.
1. Corrections of minor items of noncompliance identified may be made during the tests. In such cases, the item of noncompliance and resolution shall be documented on the Systems Functional Test Procedure.
 2. Every effort shall be made to expedite the systems functional Performance Testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Agent shall not be pressured into overlooking noncompliant work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so by direction from the VA.
 3. As the Systems Functional Performance Tests progresses and an item of noncompliance is identified, the Commissioning Agent shall discuss the issue with the Contractor and the VA.
 4. When there is no dispute on an item of noncompliance, and the Contractor accepts responsibility to correct it:
 - a. The Commissioning Agent will document the item of noncompliance and the Contractor's response and/or intentions. The Systems Functional Performance Test then continues or proceeds to another test or sequence. After the day's work is complete, the Commissioning Agent will submit a Commissioning Field Report to the VA. The Commissioning Agent will also note items of noncompliance and the Contractor's response in the Master Commissioning Issues Log. The Contractor shall correct the item of noncompliance and report completion to the VA and the Commissioning Agent.
 - b. The need for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test and the test shall be repeated.
 5. If there is a dispute about item of noncompliance, regarding whether it is an item of noncompliance, or who is responsible:
 - a. The item of noncompliance shall be documented on the test form with the Contractor's response. The item of noncompliance with

the Contractor's response shall also be reported on a Commissioning Field Report and on the Master Commissioning Issues Log.

- b. Resolutions shall be made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive and acceptance authority is with the Department of Veterans Affairs.
 - c. The Commissioning Agent will document the resolution process.
 - d. Once the interpretation and resolution have been decided, the Contractor shall correct the item of noncompliance, report it to the Commissioning Agent. The requirement for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test. Retesting shall be repeated until satisfactory performance is achieved.
- C. Cost of Retesting: The cost to retest a System Functional Performance Test shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform in compliance with the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specifications, all identical units may be considered unacceptable by the VA. In such case, the Contractor shall provide the VA with the following:
- 1. Within one week of notification from the VA, the Contractor shall examine all other identical units making a record of the findings. The findings shall be provided to the VA within two weeks of the original notice.
 - 2. Within two weeks of the original notification, the Contractor shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

3. The VA shall determine whether a replacement of all identical units or a repair is acceptable.
 4. Two examples of the proposed solution shall be installed by the Contractor and the VA shall be allowed to test the installations for up to one week, upon which the VA will decide whether to accept the solution.
 5. Upon acceptance, the Contractor shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- E. Approval: The Commissioning Agent will note each satisfactorily demonstrated function on the test form. Formal approval of the Systems Functional Performance Test shall be made later after review by the Commissioning Agent and by the VA. The Commissioning Agent will evaluate each test and report to the VA using a standard form. The VA will give final approval on each test using the same form, and provide signed copies to the Commissioning Agent and the Contractor.

3.8 DEFERRED TESTING

- A. Unforeseen Deferred Systems Functional Performance Tests: If any Systems Functional Performance Test cannot be completed due to the building structure, required occupancy condition or other conditions, execution of the Systems Functional Performance Testing may be delayed upon approval of the VA. These Systems Functional Performance Tests shall be conducted in the same manner as the seasonal tests as soon as possible. Services of the Contractor to conduct these unforeseen Deferred Systems Functional Performance Tests shall be negotiated between the VA and the Contractor.
- B. Deferred Seasonal Testing: Deferred Seasonal Systems Functional Performance Tests are those that must be deferred until weather conditions are closer to the systems design parameters. The Commissioning Agent will review systems parameters and recommend which Systems Functional Performance Tests should be deferred until weather conditions more closely match systems parameters. The Contractor shall review and comment on the proposed schedule for Deferred Seasonal Testing. The VA will review and approve the schedule for Deferred Seasonal Testing. Deferred Seasonal Systems Functional Performances Tests shall be witnessed and documented by the Commissioning Agent.

Deferred Seasonal Systems Functional Performance Tests shall be executed by the Contractor in accordance with these specifications.

3.9 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

- A. Training Preparation Conference: Before operation and maintenance training, the Commissioning Agent will convene a training preparation conference to include VA's Resident Engineer, 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 CxA will review all required O&M manuals, training agendas, and other related material to verify that the Contractor has met the operation and maintenance training requirements.

----- END -----

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

1.3 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.
- 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 Resident Engineer. 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 Resident Engineer's approval.

H. The work shall comply with the requirements of Section 01 57 19,
TEMPORARY ENVIRONMENTAL CONTROLS.

I. The work shall comply with the requirements of Section 01 00 00,
GENERAL REQUIREMENTS, Article 1.7 INFECTION PREVENTION MEASURES.

1.4 UTILITY SERVICES:

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEMOLITION:

- A. Completely demolish and remove 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 Resident Engineer. 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. Remove and legally dispose of all materials, other than earth to remain
as part of project work, from any trash dumps shown. Materials removed
shall become property of contractor and shall be disposed of in
compliance with applicable federal, state or local permits, rules
and/or regulations. All materials in the indicated trash dump areas,
including above surrounding grade and extending to a depth of 1500mm
(5feet) below surrounding grade, shall be included as part of the lump
sum compensation for the work of this section. Materials that are
located beneath the surface of the surrounding ground more than 1500 mm
(5 feet), or materials that are discovered to be hazardous, shall be

handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.

- D. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Resident Engineer. When Utility lines are encountered that are not indicated on the drawings, the Resident Engineer shall be notified prior to further work in that area.

3.2 CLEAN-UP:

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

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

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

1.3 TESTING AGENCY FOR CONCRETE MIX DESIGN:

- A. Testing agency for the trial concrete mix design retained and reimbursed by the Contractor and approved by Resident Engineer. 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
- C. Testing agency shall furnish equipment and qualified technicians to establish proportions of ingredients for concrete mixes.

1.4 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:
 - 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).

1.5 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.

1.6 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Shop Drawings: Reinforcing steel: Complete shop drawings
- C. Mill Test Reports:
 1. Reinforcing Steel.
 2. Cement.
- D. Manufacturer's Certificates:
 1. Abrasive aggregate.
 2. Lightweight aggregate for structural concrete.
 3. Air-entraining admixture.
 4. Chemical admixtures, including chloride ion content.
 5. Waterproof paper for curing concrete.
 6. Liquid membrane-forming compounds for curing concrete.
 7. Non-shrinking grout.
 8. Liquid hardener.
 9. Waterstops.
 10. Expansion joint filler.
 11. Adhesive binder.
- E. 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
- F. Test Report for Concrete Mix Designs: Trial mixes including water-cement, fly ash, ratio curves, concrete mix ingredients, and admixtures.
- G. Shoring and Reshoring Sequence: Submit for approval a shoring and reshoring sequence for flat slab/flat plate portions, prepared by a registered Professional Engineer. As a minimum, include timing of form stripping, reshoring, number of floors to be re-shored and timing of re-shore removal to serve as an initial outline of procedures subject to modification as construction progresses. Submit revisions to sequence, whether initiated by Resident Engineer (see FORMWORK) or Contractor.

1.7 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.

1.8 PRE-CONCRETE CONFERENCE:

- A. General: At least 15 days prior to submittal of design mixes, conduct a 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; lightweight aggregate manufacturer; admixture manufacturers; Resident Engineer; 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.

1.09 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):
 - 117-10.....Specifications for Tolerances for Concrete Construction and Materials and Commentary

- 211.1-91(R2009).....Standard Practice for Selecting Proportions for
Normal, Heavyweight, and Mass Concrete
- 211.2-98(R2004).....Standard Practice for Selecting Proportions for
Structural Lightweight Concrete
- 214R-11.....Guide to Evaluation of Strength Test Results of
Concrete
- 301-10.....Standard Practice for Structural Concrete
- 304R-00(R2009).....Guide for Measuring, Mixing, Transporting, and
Placing Concrete
- 305.1-06.....Specification for Hot Weather Concreting
- 306.1-90(R2002).....Standard Specification for Cold Weather
Concreting
- 308.1-11.....Specification for Curing Concrete
- 309R-05.....Guide for Consolidation of Concrete
- 318-11.....Building Code Requirements for Structural
Concrete and Commentary
- 347-04.....Guide to Formwork for Concrete
- SP-66-04.....ACI Detailing Manual
- C. American National Standards Institute and American Hardboard Association
(ANSI/AHA):
 - A135.4-2004.....Basic Hardboard
- D. American Society for Testing and Materials (ASTM):
 - A82/A82M-07.....Standard Specification for Steel Wire, Plain,
for Concrete Reinforcement
 - A185/185M-07.....Standard Specification for Steel Welded Wire
Reinforcement, Plain, for Concrete
 - A615/A615M-09.....Standard Specification for Deformed and Plain
Carbon Steel Bars for Concrete Reinforcement
 - A653/A653M-11.....Standard Specification for Steel Sheet, Zinc
Coated (Galvanized) or Zinc Iron Alloy Coated
(Galvannealed) by the Hot Dip Process
 - A706/A706M-09.....Standard Specification for Low Alloy Steel
Deformed and Plain Bars for Concrete
Reinforcement
 - C31/C31M-10.....Standard Practice for Making and Curing Concrete
Test Specimens in the field
 - C33/C33M-11A.....Standard Specification for Concrete Aggregates
 - C39/C39M-12.....Standard Test Method for Compressive Strength of
Cylindrical Concrete Specimens
 - C94/C94M-12.....Standard Specification for Ready Mixed Concrete

C143/C143M-10.....Standard Test Method for Slump of Hydraulic
Cement Concrete

C150-11.....Standard Specification for Portland Cement

C171-07.....Standard Specification for Sheet Materials for
Curing Concrete

C172-10.....Standard Practice for Sampling Freshly Mixed
Concrete

C173-10.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Volumetric Method

C192/C192M-07.....Standard Practice for Making and Curing Concrete
Test Specimens in the Laboratory

C231-10.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Pressure Method

C260-10.....Standard Specification for Air Entraining
Admixtures for Concrete

C309-11.....Standard Specification for Liquid Membrane
Forming Compounds for Curing Concrete

C330-09.....Standard Specification for Lightweight
Aggregates for Structural Concrete

C494/C494M-11.....Standard Specification for Chemical Admixtures
for Concrete

C618-12.....Standard Specification for Coal Fly Ash and Raw
or Calcined Natural Pozzolan for Use in Concrete

C666/C666M-03(R2008)....Standard Test Method for Resistance of Concrete
to Rapid Freezing and Thawing

C881/C881M-10.....Standard Specification for Epoxy Resin Base
Bonding Systems for Concrete

C1107/1107M-11.....Standard Specification for Packaged Dry,
Hydraulic-Cement Grout (Non-shrink)

C1315-11.....Standard Specification for Liquid Membrane
Forming Compounds Having Special Properties for
Curing and Sealing Concrete

D6-95(R2011).....Standard Test Method for Loss on Heating of Oil
and Asphaltic Compounds

D297-93(R2006).....Standard Methods for Rubber Products Chemical
Analysis

D412-06AE2.....Standard Test Methods for Vulcanized Rubber and
Thermoplastic Elastomers - Tension

D1751-04(R2008).....Standard Specification for Preformed Expansion
Joint Filler for Concrete Paving and Structural

- Construction (Non-extruding and Resilient Bituminous Types)
- D4263-83(2012).....Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- D4397-10.....Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
- E1155-96(R2008).....Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers
- F1869-11.....Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. American Welding Society (AWS):
- D1.4/D1.4M-11.....Structural Welding Code - Reinforcing Steel
- F. Concrete Reinforcing Steel Institute (CRSI):
- Handbook 2008
- G. National Cooperative Highway Research Program (NCHRP):
- Report On.....Concrete Sealers for the Protection of Bridge Structures
- H. U. S. Department of Commerce Product Standard (PS):
- PS 1.....Construction and Industrial Plywood
- PS 20.....American Softwood Lumber
- I. U. S. Army Corps of Engineers Handbook for Concrete and Cement:
- CRD C513.....Rubber Waterstops
- 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.
- 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. Metal for Concrete Rib-Type Construction: Steel (removal type) of suitable weight and form to provide required rigidity.
- D. Permanent Steel Form for Concrete Slabs: Corrugated, ASTM A653, Grade E, and Galvanized, ASTM A653, G90. Provide venting where insulating concrete fill is used.
- 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.
- B. Fly Ash: ASTM C618, Class F including supplementary optional requirements relating to reactive aggregates and alkalis, 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. 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.
- 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 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.
- 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 µm (No. 100) sieve.
- 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. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.
 7. Certification: Written conformance to the requirements above and the chloride ion content of the admixture prior to mix design review.
- H. Vapor Barrier: ASTM E 1745 Class A, 15 mil.
- I. Reinforcing Steel: ASTM A615, or ASTM A996, deformed, grade as shown.
- J. Reinforcing bars to be welded: ASTM A706.
- K. Cold Drawn Steel Wire: ASTM A82.
- L. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.
- M. Expansion Joint Filler: ASTM D1751.
- N. Sheet Materials for Curing Concrete: ASTM C171.
- O. Liquid Membrane-forming Compounds for Curing Concrete: ASTM C309, Type I, with fugitive dye, and shall meet the requirements of ASTM C1315. Compound shall be compatible with scheduled surface treatment, such as paint and resilient tile, and shall not discolor concrete surface.
- P. Non-Shrink Grout:
1. ASTM C1107, pre-mixed, produce a compressive strength of at least 18 MPa at three days and 35 MPa (5000 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.
- Q. Adhesive Binder: ASTM C881.
- R. Waterstops:
1. 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.

- S. Epoxy Joint Filler: Two component, 100 percent solids compound, with a minimum shore D hardness of 50.
- T. Bonding Admixture: Non-rewettable, polymer modified, bonding compound.

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 and 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 Resident Engineer 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.
- 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 Resident Engineer 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. Resident Engineer 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. Fly ash shall not be used in high-early mix design.

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete Strength		Non-Air- Entrained	Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/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)	0.55	340 (570)	0.50
25 (3000) ^{1,3}	280 (470)	0.65	290 (490)	0.55
25 (3000) ^{1,2}	300 (500)	*	310 (520)	*

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. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.
 4. 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.

TABLE II - MAXIMUM SLUMP, MM (INCHES)*

Type of Construction	Normal Weight Concrete	Lightweight Structural Concrete
Reinforced Footings	75mm (3 inches)	75 mm (3 inches)

and Substructure Walls		
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.
- 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.
- H. Lightweight structural concrete shall not weigh more than air-dry unit weight shown. 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.
- I. 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).
- J. 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.
- K. 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, Resident Engineer 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, Resident Engineer 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, Resident Engineer 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 construction or replaced, if directed by the Resident Engineer.

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 Resident Engineer. 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	21 degrees C (70 degrees F.)

(0 degrees to 30 degrees F.)	
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1. Services of aggregate manufacturer's representative shall be furnished during the design of trial mixes and as requested by the Resident Engineer 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 Resident Engineer.

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 Resident Engineer approves their reuse.
 2. Provide forms for concrete footings unless Resident Engineer 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.
 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 blued 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 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 Resident Engineer. Install sleeves in beams, joists, or columns that are not shown, but are permitted by the Resident Engineer, 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 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. 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. 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 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.
- 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 Resident Engineer.
- E. Bending: Bend bars cold, unless otherwise approved. Do not field bend bars partially embedded in concrete, except when approved by Resident Engineer.
- 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 on grade shall be placed on a continuous vapor barrier.
1. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.
 2. Vapor barrier joints lapped 150 mm (6 inches) and sealed with compatible waterproof pressure-sensitive tape.

3. Patch punctures and tears.

3.4 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 Resident Engineer.

3.5 EXPANSION JOINTS AND CONTRACTION JOINTS:

A. 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.

3.6 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 Resident Engineer 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.

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 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 Resident Engineer.
- D. Placing: For special requirements see Paragraphs, HOT WEATHER and COLD 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).
 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 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.
 2. 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.
 3. 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 its initial set has taken place, or after 45 minutes of elapsed time during concrete placement.
 4. 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.
 5. 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.

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.

3.7 HOT WEATHER:

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 Resident Engineer.

3.8 COLD WEATHER:

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 Resident Engineer.

3.9 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 Resident Engineer.
 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.

3.10 REMOVAL OF FORMS:

- A. Remove in a manner to assure complete safety of structure after the following conditions have been met.
 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. Exercise care to assure that newly unsupported portions of structure are not subjected to heavy construction or material loading.

3.11 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 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.

3.12 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 Resident Engineer, 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 μ m (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 m² (2 square feet) in each 93 m² (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 Resident Engineer 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 Resident Engineer determines that the method is proving insufficient to meet required finish tolerances and directs use of rigid screed guides. Where wet screeds are allowed, 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. 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.
 8. 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.
 9. 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.
 10. 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 Resident Engineer from sample panel.

11. 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 F_F 25/F_L 20
 - b) Minimum local value F_F 17/F_L 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.

12. Measurements

- a. Department of Veterans Affairs retained testing laboratory will take measurements as directed by Resident Engineer, 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.

13. Acceptance/ Rejection:

- a. If individual slab section measures less than either of specified minimum local F_F/F_L 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 F_F/F_L numbers, then whole slab shall be rejected and remedial measures shall be required.

14. 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 Resident Engineer, until a slab finish constructed within specified tolerances is accepted.

3.13 APPLIED TOPPING:

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

3.14 RESURFACING FLOORS:

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.

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SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Painting: Section 09 91 00, PAINTING.
- C. Steel Joist: Section 05 21 00, STEEL JOIST FRAMING.

1.3 QUALITY ASSURANCE:

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

1.4 TOLERANCES:

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

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

1.5 DESIGN:

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

qualified engineer registered in the state where the project is located.

Submit calculations for review before preparation of detail drawings.

1.6 REGULATORY REQUIREMENTS:

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

1.7 SUBMITTALS:

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

1.8 APPLICABLE PUBLICATIONS:

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

- A283/A283M-03(R2007)....Standard Specification for Low and Intermediate
Tensile Strength Carbon Steel Plates
- A307-10.....Standard Specification for Carbon Steel Bolts
and Studs, 60,000 psi Tensile Strength
- A325-10.....Standard Specification for Structural Bolts,
Steel, Heat Treated, 120/105 ksi Minimum Tensile
Strength
- A490-12.....Standard Specification for Heat-Treated Steel
Structural Bolts 150 ksi Minimum Tensile
Strength
- A500/A500M-10a.....Standard Specification for Cold Formed Welded
and Seamless Carbon Steel Structural Tubing in
Rounds and Shapes
- A501-07.....Standard Specification for Hot-Formed Welded and
Seamless Carbon Steel Structural Tubing
- A572/A572M-07.....Standard Specification for High-Strength
Low-Alloy Columbium-Vanadium Structural Steel
- A992/A992M-11.....Standard Specification for Structural Steel
Shapes
- E. American Welding Society (AWS):
 - D1.1/D1.1M-10.....Structural Welding Code-Steel
- F. Research Council on Structural Connections (RCSC) of The Engineering
Foundation:
 - Specification for Structural Joints Using ASTM A325 or A490 Bolts
- G. Military Specifications (Mil. Spec.):
 - MIL-P-21035.....Paint, High Zinc Dust Content, Galvanizing,
Repair
- H. Occupational Safety and Health Administration (OSHA):
 - 29 CFR Part 1926-2001...Safety Standards for Steel Erection

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Structural Steel: ASTM A572 W Shapes, A36 misc. steel
- B. Structural Tubing: ASTM A500, Grade B.
- C. Steel Pipe: ASTM A53, Grade B.
- D. Bolts, Nuts and Washers:
 - 1. High-strength bolts, including nuts and washers: ASTM A325 or A490 as
noted.
 - 2. Bolts and nuts, other than high-strength or as shown on plans: ASTM
A307, Grade A.

3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ANSI Standard B18.22.1.

E. Zinc Coating: ASTM A123.

F. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035.

PART 3 - EXECUTION

3.1 CONNECTIONS (SHOP AND FIELD):

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

3.2 FABRICATION:

Fabrication in accordance with Chapter M, AISC 360. .

3.3 SHOP PAINTING:

- A. General: Shop paint steel with primer in accordance with AISC 303, Section 6.
- B. Shop paint for steel surfaces is specified in Section 09 91 00, PAINTING.
- C. Do not apply paint to following:
 - 1. Surfaces within 50 mm (2 inches) of joints to be welded in field.
 - 2. Surfaces which will be encased in concrete.
 - 3. Surfaces which will receive sprayed on fireproofing.
 - 4. Top flange of members which will have shear connector studs applied.
- D. Structural steel in the interstitial space that does not receive sprayed on fireproofing shall be painted with primer in accordance with general requirement of shop painting.

3.4 ERECTION:

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

3.5 FIELD PAINTING:

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

B. Finish painting of steel surfaces is specified in Section 09 91 00,
PAINTING.

3.6 SURVEY:

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 Resident Engineer 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 Manual.

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SECTION 05 36 00
COMPOSITE METAL DECKING

PART 1 - GENERAL

1.1 DESCRIPTION:

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:

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

1.3 DESIGN REQUIREMENTS:

- A. Design steel decking in accordance with American Iron And Steel Institute publication "Specifications 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 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. Shear Stud Layouts: Submit drawings showing the number, pattern, spacing and configuration of the shear studs for each beam and girder.

1.5 QUALITY ASSURANCE:

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

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Refer to the latest edition of all referenced Standards and codes.
- B. American Iron and Steel Institute (AISI): Specification and Commentary for the Design of Cold-Formed Steel Structural Members (Latest Edition).
- C. American Society of Testing and Materials (ASTM):
 - A36/A36M-08.....Standard Specification for Carbon Structural Steel
 - A108-07.....Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality
 - 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):
 - D1.1/D1.1M-10.....Structural Welding Code - Steel
 - D1.3/D1.3M-08.....Structural Welding Code - Sheet Steel
- E. Military Specifications (Mil. Spec.):
 - MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

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, G60.
- 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 stud

shall be as shown on drawings. Studs manufactured by a company normally engaged in the manufacture 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: ASTM A36.
- F. Welding Electrode: E60XX minimum.
- G. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:
 - 1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
 - 2. Continuous sheet metal edging: at openings and concrete slab edges. 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 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. 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. Fastening Deck Units:
 - 1. Fasten floor deck units to steel supporting members by not less than 19 mm (3/4 inch) diameter puddle welds or elongated welds of equal strength, spaced per plans and not more than 305 mm (12 inches) o.c. with a minimum of two welds per unit at each support. Where two units abut, fasten each unit individually to the supporting steel framework.
 - 2. Tack weld or use self-tapping No. 8 or larger machine screws at 915 mm (3 feet) o.c. for fastening end closures. Only use welds to attach longitudinal end closures.
 - 3. Fasten side laps of adjacent floor deck units per plans.

- I. Welding to conform to AWS D1.3 and done by competent experienced welding mechanics.
- J. 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.
- K. Provide metal concrete stops at edges of deck as required.
- L. 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 Resident Engineer. 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.
- M. 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, 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.

3.2 CLEANING:

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.
 - 2. Steel joists.

1.2 RELATED WORK:

- A. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- B. Non-load-bearing metal stud framing assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- C. Gypsum board assemblies: Section 09 29 00, GYPSUM BOARD.

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 on plans.

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, and information necessary to complete installation as shown and specified.
- C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

1.5 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Iron and Steel Institute (AISI):
Specification and Commentary for the Design of Cold-Formed Steel Structural Members (1996)
- C. American Society of Testing and Materials (ASTM):

- A36/A36M-08.....Standard Specifications for Carbon Structural Steel
- A123/A123M-09.....Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- A153/A153M-09.....Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- A307-10.....Standard Specifications for Carbon Steel Bolts and Studs
- A653/A653M-10.....Standard Specifications for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- C1107/C1107M-08.....Standard Specifications for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
- E488-96(R2003).....Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
- E1190-95(R2007).....Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members
- D. American Welding Society (AWS):
- D1.3/D1.3M-08.....Structural Welding Code-Sheet Steel
- E. Military Specifications (Mil. Spec.):
- MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Sheet Steel for joists, studs and accessories 16 gage and heavier: ASTM A653, structural steel, zinc coated G60, with a yield of 340 MPa (50 ksi) minimum.
- B. Sheet Steel for joists, studs and accessories 18 gage and lighter: ASTM A653, structural steel, zinc coated G60, with a yield of 230 MPa (33 ksi) minimum.
- C. Galvanizing Repair Paint: MIL-P-21035B.

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:
1.52 mm (0.0598 inch)
 2. Flange Width:

(1-5/8 inches)

3. Web: Punched.

B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: Matching steel studs.
2. Flange Width: Manufacturer's standard deep flange where indicated, standard flange elsewhere.

2.3 JOIST FRAMING:

A. Steel Joists: Manufacturer's standard C-shaped steel joists, unpunched, of web depths indicated, with lipped flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: 1.52 mm (0.0598 inch
2. Flange Width: 41 mm (1 5/8 inches) minimum.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: Matching steel joists.
2. Flange Width: 41 mm (1 5/8-inches) minimum.

2.4 FRAMING ACCESSORIES:

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

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Gusset plates.
5. Deflection track and vertical slide clips.
6. Stud kickers and girts.
7. Joist hangers and end closures.
8. Reinforcement plates.

2.5 ANCHORS, CLIPS, AND FASTENERS:

A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.

B. Cast-in-Place Anchor Bolts and Studs: ASTM A307, Grade A, zinc coated by the hot-dip process according to ASTM A153.

- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.6 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. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.
- F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.
- G. Install headers in all openings that are larger than the stud spacing in that wall.
- H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.
- I. Studs in one piece for their entire length, splices will not be permitted.
- J. Provide a load distribution member at top track where joist is not located directly over bearing stud.
- K. Provide joist bridging and web stiffeners at reaction points where shown.
- L. Provide end blocking where joist ends are not restrained from rotation.
- M. Provide an additional joist under parallel partitions, unless otherwise shown, when partition length exceeds one-half joist span and when floor and roof openings interrupt one or more spanning members.
- N. Provide temporary bracing and leave in place until framing is permanently stabilized.
- O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.
- P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.3 TOLERANCES:

- A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.
- C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.

D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

3.4 FIELD REPAIR:

Touch-up damaged galvanizing with galvanizing repair paint.

- - - E N D - - -

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.
- B. Items specified.
 - 1. Support for Wall and Ceiling Mounted Items: (12, 14A, 14C)
 - 2. Frames: (24E)
 - 3. Guards
 - 4. Shelf Angles
 - 5. Gas Racks

1.2 RELATED WORK

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

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Ceiling Hatches
- C. Shop Drawings:
 - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
 - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
 - 3. Provide templates and rough-in measurements as required.
- D. Manufacturer's Certificates:
 - 1. Anodized finish as specified.
 - 2. Live load designs as specified.
- E. Design Calculations for specified live loads including dead loads.
- F. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.4 QUALITY ASSURANCE

- A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each product type shall be the same and be made by the same manufacturer.
- C. Assembled product to the greatest extent possible before delivery to the site.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
 - B18.6.1-97.....Wood Screws
 - B18.2.2-87(R2005).....Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
 - A36/A36M-08.....Structural Steel
 - A47-99(R2009).....Malleable Iron Castings
 - A48-03(R2008).....Gray Iron Castings
 - A53-10.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated
Welded and Seamless
 - A123-09.....Zinc (Hot-Dip Galvanized) Coatings on Iron and
Steel Products
 - A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel
Steel Plate, Sheet and Strip
 - A269-10.....Seamless and Welded Austenitic Stainless Steel
Tubing for General Service
 - A307-10.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile
Strength
 - A312/A312M-09.....Seamless, Welded, and Heavily Cold Worked
Austenitic Stainless Steel Pipes
 - A391/A391M-07.....Grade 80 Alloy Steel Chain
 - A653/A653M-10.....Steel Sheet, Zinc Coated (Galvanized) or Zinc-
Iron Alloy Coated (Galvannealed) by the Hot-Dip
Process
 - A786/A786M-09.....Rolled Steel Floor Plate

- B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods,
Wire, Shapes, and Tubes
- B456-03(R2009).....Electrodeposited Coatings of Copper Plus Nickel
Plus Chromium and Nickel Plus Chromium
- B632-08.....Aluminum-Alloy Rolled Tread Plate
- C1107-08.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- D3656-07.....Insect Screening and Louver Cloth Woven from
Vinyl-Coated Glass Yarns
- F436-10.....Hardened Steel Washers
- F468-10.....Nonferrous Bolts, Hex Cap Screws, and Studs for
General Use
- F593-02(R2008).....Stainless Steel Bolts, Hex Cap Screws, and Studs
- F1667-11.....Driven Fasteners: Nails, Spikes and Staples
- D. American Welding Society (AWS):
 - D1.1-10.....Structural Welding Code Steel
 - D1.2-08.....Structural Welding Code Aluminum
 - D1.3-08.....Structural Welding Code Sheet Steel
- E. National Association of Architectural Metal Manufacturers (NAAMM)
 - AMP 521-01.....Pipe Railing Manual
 - AMP 500-06.....Metal Finishes Manual
 - MBG 531-09.....Metal Bar Grating Manual
 - MBG 532-09.....Heavy Duty Metal Bar Grating Manual
- F. Structural Steel Painting Council (SSPC)/Society of Protective Coatings:
 - SP 1-04.....No. 1, Solvent Cleaning
 - SP 2-04.....No. 2, Hand Tool Cleaning
 - SP 3-04.....No. 3, Power Tool Cleaning
- G. Federal Specifications (Fed. Spec):
 - RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.
- B. Railings and Handrails: 900 N (200 pounds) in any direction at any point.

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. Cast-Iron: ASTM A48, Class 30, commercial pattern.
- F. Malleable Iron Castings: A47.
- G. Primer Paint: As specified in Section 09 91 00, PAINTING.
- H. Stainless Steel Tubing: ASTM A269, type 302 or 304.
- I. Modular Channel Units:
 - 1. Factory fabricated, channel shaped, cold formed sheet steel shapes, complete with fittings bolts and nuts required for assembly.
 - 2. Form channel with in turned pyramid shaped clamping ridges on each side.
 - 3. Provide case hardened steel nuts with serrated grooves in the top edges designed to be inserted in the channel at any point and be given a quarter turn so as to engage the channel clamping ridges. Provide each nut with a spring designed to hold the nut in place.
 - 4. Factory finish channels and parts with oven baked primer when exposed to view. Channels fabricated of ASTM A525, G90 galvanized steel may have primer omitted in concealed locations. Finish screws and nuts with zinc coating.
 - 5. Fabricate snap-in closure plates to fit and close exposed channel openings of not more than 0.3 mm (0.0125 inch) thick stainless steel.
- J. Grout: ASTM C1107, pourable type.
- K. Insect Screening: ASTM D3656.

2.3 HARDWARE

- A. Rough Hardware:
 - 1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
 - 2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.
- B. Fasteners:
 - 1. Bolts with Nuts:
 - a. ASME B18.2.2.
 - b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
 - c. ASTM F468 for nonferrous bolts.
 - d. ASTM F593 for stainless steel.
 - 2. Screws: ASME B18.6.1.

3. Washers: ASTM F436, type to suit material and anchorage.
4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.4 FABRICATION GENERAL

A. Material:

1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
2. Use material free of defects which could affect the appearance or service ability of the finished product.

B. Size:

1. Size and thickness of members as shown.
2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections:

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

D. Fasteners and Anchors:

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.

3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship:

1. General:

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

2. Welding:

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

3. Joining:

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

4. Anchors:

- a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
- b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.

5. Cutting and Fitting:

- a. Accurately cut, machine and fit joints, corners, copes, and miters.
- b. Fit removable members to be easily removed.
- c. Design and construct field connections in the most practical place for appearance and ease of installation.
- d. Fit pieces together as required.
- e. Fabricate connections for ease of assembly and disassembly without use of special tools.
- f. Joints firm when assembled.
- g. Conceal joining, fitting and welding on exposed work as far as practical.
- h. Do not show rivets and screws prominently on the exposed face.
- i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:

1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
2. Aluminum: NAAMM AMP 501.
 - a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.
 - b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.
 - c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
 - d. Painted: AA-C22R10.
3. Steel and Iron: NAAMM AMP 504.
 - a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
 - b. Surfaces exposed in the finished work:

- 1) Finish smooth rough surfaces and remove projections.
- 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
- c. Shop Prime Painting:
 - 1) Surfaces of Ferrous metal:
 - a) Items not specified to have other coatings.
 - b) Galvanized surfaces specified to have prime paint.
 - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
 - d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
 - e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
 - 2) Non ferrous metals: Comply with MAAMM-500 series.
4. Stainless Steel: NAAMM AMP-504 Finish No. 4.
5. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.
- G. Protection:
 1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
 2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

2.5 SUPPORTS

- A. General:
 1. Fabricate ASTM A36 structural steel shapes as shown.
 2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
 3. Field connections may be welded or bolted.
- B. For Ceiling Hung Toilet Stall:
 1. Use a continuous steel channel above pilasters with hangers centered over pilasters.
 2. Make provision for installation of stud bolts in lower flange of channel.
 3. Provide a continuous steel angle at wall and channel braces spaced as shown.
 4. Use threaded rod hangers.

5. Provide diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.

C. For Wall Mounted Items:

1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.
4. Steel hat channels where shown. Flange cut and flattened for anchorage to stud.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

D. For Intravenous Track and Cubical Curtain Track:

1. Fabricate assembly of steel angle as shown.
2. Drill angle bent ends for anchor screws to acoustical suspension system and angle for hanger wires.
3. Provide pipe sleeve welded to angle.

2.6 FRAMES

A. Channel Door Frames:

1. Fabricate of structural steel channels of size shown.
2. Miter and weld frames at corners.
3. Where anchored to masonry or embedded in concrete, weld to back of frame at each jamb, 5 mm (3/16 inch) thick by 44 mm (1-3/4 inch) wide steel strap anchors with ends turned 50 mm (2 inches), and of sufficient length to extend at least 300 mm (12 inches) into wall. Space anchors 600 mm (24 inches) above bottom of frame and 600 mm (24 inches) o.c. to top of jamb. Weld clip angles to bottom of jambs and provide holes for expansion bolts.
4. Where anchored to concrete or masonry in prepared openings, drill holes at jambs for anchoring with expansion bolts. Weld clip angles to bottom of frame and provide holes for expansion bolt anchors as shown. Drill holes starting 600 mm (24 inches) above bottom of frame and 600 mm (24 inches) o.c. to top of jamb and at top of jamb. Provide pipe spacers at holes welded to channel.
5. Where closure plates are shown, continuously weld them to the channel flanges.
6. Weld continuous 19 x 19 x 3 mm (3/4 x 3/4 x 1/8 inch) thick steel angles to the interior side of each channel leg at the head and jambs to form a caulking groove.

7. Prepare frame for installation of hardware specified in Section 08 71 00, DOOR HARDWARE.
 - a. Cut a slot in the lock jamb to receive the lock bolt.
 - b. Where shown use continuous solid steel bar stops at perimeter of frame, weld or secure with countersunk machine screws at not more than 450 mm (18 inches) on center.

2.7 GUARDS

A. Wall Corner Guards:

1. Fabricate from steel angles and furnish with anchors as shown.
2. Continuously weld anchor to angle.

2.11 SHELF ANGLES

- A. Fabricate from steel angles of size shown.
- B. Fabricate angles with horizontal slotted holes for 19 mm (3/4 inch) bolts spaced at not over 900 mm (3 feet) on centers and within 300 mm (12 inches) of ends.
- C. Provide adjustable malleable iron inserts for embedded in concrete framing.

2.17 TRAP DOOR AND FRAMES WITH CEILING HATCH

A. Ceiling Hatch:

1. Construct hatch with "T" or angle frame designed to support edge of ceiling and hatch, weld to well lining.
2. Form hatch panels of 3 mm (1/8 inch) steel, 5 mm (3/16 inch) aluminum or 1 mm (0.0359 inch) thick steel of pan type construction with 25 mm (one inch) of mineral fiber insulation between.
3. Use counter balance device, hinges, latch, hangers and other accessories required for installation and operation of hatch with not over 90 N (20 pounds) of force.
4. Fabricate panels flush and reinforced to remain flat.
5. Locate hatch panel flush with frame.

F. Finish with baked on 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 is set.

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

3.2 INSTALLATION OF SUPPORTS

- A. Anchorage to structure.
 1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
 2. Secure supports to concrete inserts by bolting or continuous welding as shown.
 3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
 4. Secure steel plate or hat channels to studs as detailed.
- B. Supports for Wall Mounted items:
 1. Locate center of support at anchorage point of supported item.
 2. Locate support at top and bottom of wall hung cabinets.
 3. Locate support at top of floor cabinets and shelving installed against walls.
 4. Locate supports where required for items shown.
- C. Supports for intravenous (IV) Track and Cubicle Curtain Track:
 1. Install assembly where shown after ceiling suspension grid is installed.
 2. Drill angle for bolt and weld nut to angle prior to installation of tile.
- D. Support for cantilever grab bars:

1. Locate channels or tube in partition for support as shown, and extend full height from floor to underside of structural slab above.
2. Anchor at top and bottom with angle clips bolted to channels or tube with two, 9 mm (3/8 inch) diameter bolts.
3. Anchor to floors and overhead construction with two 9 mm (3/8 inch) diameter bolts.
4. Fasten clips to concrete with expansion bolts, and to steel with machine bolts or welds.

3.3 DOOR FRAMES

- A. Secure clip angles at bottom of frames to concrete slab with expansion bolts as shown.
- B. Level and plumb frame; brace in position required.
- C. At masonry, set frames in walls so anchors are built-in as the work progresses unless shown otherwise.
- D. Set frames in formwork for frames cast into concrete.
- E. Where frames are set in prepared openings, bolt to wall with spacers and expansion bolts.

3.4 OTHER FRAMES

- A. Set frame flush with surface unless shown otherwise.
- B. Anchor frames at ends and not over 450 mm (18 inches) on centers unless shown otherwise.
- C. Set in formwork before concrete is placed.

3.5 GUARDS

- A. Steel Angle Corner Guards:
 1. Set angles flush with edge of opening and finish floor or wall or as shown.
 2. At existing construction fasten angle and filler piece to adjoining construction with 16 mm (5/8 inch) diameter by 75 mm (3 inch) long expansion bolts 450 mm (18 inches) on center.

3.6 SHELF ANGLES

- A. Anchor shelf angles with 19 mm (3/4 inch) bolts unless shown otherwise in adjustable malleable iron inserts, set level at elevation shown.
- B. Provide expansion space at end of members.

3.7 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.

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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.
 - Counters or work tops
 - Counter Shelf
 - Wall panels
 - Seats and benches
 - Mounting Strips, Shelves, and Rods

1.2 RELATED WORK

- A. Fabricated Metal brackets, bench supports and countertop legs: Section 05 50 00, METAL FABRICATIONS.
- B. Wood doors: Section 08 14 00, INTERIOR WOOD DOORS.
- C. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Stock Casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.
- E. Other Countertops: Division 11, EQUIPMENT and Division 12, FURNISHINGS.
- F. 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:

Plastic laminate finished plywood or particleboard, 150 mm by 300 mm (six by twelve inches).
- D. Certificates:
 - 1. Indicating preservative of materials meet the requirements specified.
 - 2. Indicating moisture content of materials meet the requirements specified.
- E. LEED Submittals:
 - 1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation

- that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
- 2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
- 3. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.
- F. List of acceptable sealers for fire retardant and preservative treated materials.
- G. 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 Resident Engineer. Store at a minimum temperature of 21°C (70°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):
 - A36/A36M-08.....Structural Steel
 - A53-12.....Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
 - A167-99 (R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - B26/B26M-09.....Aluminum-Alloy Sand Castings
 - B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - E84-10.....Surface Burning Characteristics of Building Materials
- C. American Hardboard Association (AHA):

- A135.4-04.....Basic Hardboard
- D. Builders Hardware Manufacturers Association (BHMA):
 - A156.9-03.....Cabinet Hardware
 - A156.11-10.....Cabinet Locks
 - A156.16-08.....Auxiliary Hardware
- E. Hardwood Plywood and Veneer Association (HPVA):
 - HP1-09.....Hardwood and Decorative Plywood
- F. National Particleboard Association (NPA):
 - A208.1-09.....Wood Particleboard
- G. American Wood-Preservers' Association (AWPA):
 - AWPA C1-03.....All Timber Products - Preservative Treatment by
Pressure Processes
- H. Architectural Woodwork Institute (AWI):
 - AWI-09.....Architectural Woodwork Quality Standards and
Quality Certification Program
- I. National Electrical Manufacturers Association (NEMA):
 - LD 3-05.....High-Pressure Decorative Laminates
- J. U.S. Department of Commerce, Product Standard (PS):
 - PS20-10.....American Softwood Lumber Standard
- K. Military Specification (Mil. Spec):
 - MIL-L-19140E.....Lumber and Plywood, Fire-Retardant Treated
- L. Federal Specifications (Fed. Spec.):
 - A-A-1922A.....Shield Expansion
 - A-A-1936.....Contact Adhesive
 - FF-N-836D.....Nut, Square, Hexagon Cap, Slotted, Castle
 - FF-S-111D(1).....Screw, Wood
 - MM-L-736(C).....Lumber, Hardwood

PART 2 - PRODUCTS

2.1 LUMBER

- A. Grading and Marking:
 - 1. Lumber shall bear the grade mark, stamp, or other identifying marks indicating grades of material.
 - 2. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.

3. The inspection agency for lumber shall be approved by the Board of Review, American Lumber Standards Committee, to grade species used.

B. Sizes:

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

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

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

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

E. Use edge grain Wood members exposed to weather.

2.2 PLYWOOD

A. Softwood Plywood:

1. Prod. Std.
2. Grading and Marking:
 - a. Each sheet of plywood shall bear the mark of a recognized 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.
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. Plastic Laminate Plywood Cores:
 - a. Exterior Type, and species group.
 - b. Veneer Grade: A-C.
5. Shelving Plywood:
 - a. Interior Type, any species group.
 - b. Veneer Grade: A-B or B-C.
6. Other: As specified for item.

B. Hardwood Plywood:

1. HPVA: HP.1
2. Species of face veneer shall be as shown or as specified in connection with each particular item.

3. Inside of Building:
 - a. Use Type II (interior) A grade veneer for transparent finish.
 - b. Use Type II (interior) Sound Grade veneer for paint finish.
4. On Outside of Building:
 - a. Use Type I, (exterior) A Grade veneer for natural or stained and varnish finish.
 - b. Use Type I, (exterior) Sound Grade veneer for paint finish.
5. Use plain sliced red oak unless specified otherwise.

2.3 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, and exterior bond, for tops with sinks.
- C. General Use: Type 1, Grade 1-M-3 or Type 2, Grade 2-M-2.

2.4 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, CLS as a minimum.
 1. Plastic laminate clad plywood or particle board.
 2. Resin impregnated decorative paper thermally fused to particle board.
- D. Backing sheet on bottom of plastic laminate covered wood tops: Backer, Type HGP.
- E. Post Forming Fabrication, Decorative Surfaces: Post forming, Type HGP.

2.5 BUILDING BOARD (HARDBOARD)

- A. ANSI/AHA A135.4, 6 mm (1/4 inch) thick unless specified otherwise.
- B. Perforated hardboard (Pegboard): Type 1, Tempered perforated 6 mm (1/4 inch) diameter holes, on 25 mm (1 inch) centers each way, smooth surface one side.
- C. Wall paneling at gas chain rack: Type 1, tempered, Fire Retardant treated, smooth surface on side.

2.6 ADHESIVE

- A. For Plastic Laminate: Fed. Spec. A-A-1936.

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

C. For Exterior Millwork: Unextended melamine resin, phenol resin, or resorcinol resin.

2.7 STAINLESS STEEL

ASTM A167, Type 302 or 304.

2.8 ALUMINUM CAST

ASTM B26

2.9 ALUMINUM EXTRUDED

ASTM B221

2.10 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 electric-galvanizing process. Galvanized where specified.
2. Use galvanized coating on ferrous metal for exterior work unless non-ferrous metals or stainless is used.
3. Fasteners:
 - a. Bolts with Nuts: FF-N-836.
 - b. Expansion Bolts: A-A-1922A.
 - c. Screws: Fed. Spec. FF-S-111.

B. Finish Hardware

1. Cabinet Hardware: ANSI A156.9.
 - a. Door/Drawer Pulls: B02011. Door in seismic zones: B03182.
 - b. Drawer Slides: B05051 for drawers over 150 mm (6 inches) deep, B05052 for drawers 75 mm to 150 mm 3 to 6 inches) deep, and B05053 for drawers less than 75 mm (3 inches) deep.
 - c. Sliding Door Tracks: B07063.
 - d. Adjustable Shelf Standards: B4061 with shelf rest B04083.
 - e. Concealed Hinges: B1601, minimum 110 degree opening.
 - f. Butt Hinges: B01361, for flush doors, B01381 for inset lipped doors, and B01521 for overlay doors.
 - g. Cabinet Door Catch: B0371 or B03172.
 - h. Vertical Slotted Shelf Standard: B04103 with shelf brackets B04113, sized for shelf depth.
2. Cabinet Locks: ANSI A156.11.
 - a. Drawers and Hinged Door: E07262.

- b. Sliding Door: E07162.
- 3. Auxiliary Hardware: ANSI A156.16.
 - a. Shelf Bracket: B04041, japanned or enameled finish.
 - b. Combination Garment rod and Shelf Support: B04051 japanned or enamel finish.
 - c. Closet Bar: L03131 chrome finish of required length.
 - d. Handrail Brackets: L03081 or L03101.
 - 1) Cast Aluminum, satin polished finish.
 - 2) Cast Malleable Iron, japanned or enamel finish.
- 4. Steel Channel Frame and Leg supports for Counter top. Fabricated under Section 05 50 00, METAL FABRICATION.
- 5. Pipe Bench Supports:
 - a. Pipe: ASTM A53.
- 6. Fabricated Wall Bench Supports:
 - a. Steel Angles: ASTM A36 steel with chrome finish, or ASTM A167, stainless steel with countersunk wood screws, holes at 64 mm (2-1/2 inches) on center on horizontal member.
 - b. Use 38 mm by 38 mm by 5 mm (1-1/2 by 1-1/2 by 3/16 inch) angle thick drilled for screw and bolt holes unless shown otherwise. Drill 6 mm (1/4 inch) holes for anchors on vertical member, not more than 200 mm (8 inches) on center between ends or corners.
 - c. Stainless steel bars brackets: ASTM A167, fabricated to shapes shown, Number 4 finish. Use 50 mm by 5 mm (2 inch by 3/16 inch) bars unless shown otherwise. Drill for anchors and screws. Drill countersunk wood screw holes at 64 mm (2-1/2 inches) on center on horizontal members and not less than two 13 mm (1/4 inch) hole for anchors on vertical member.
- 7. Thru-Wall Counter Brackets:
 - a. Steel angles drilled for fasteners on 100 mm (4 inches) centers.
 - b. Baked enamel prime coat finish.
- 8. Folding Shelf Bracket:
 - a. Steel Shelf bracket, approximately 400 mm by 400 mm (16 by 16 inches), folding type with baked gray enamel finish or chrome plated finish.
 - b. Bracket legs shall be approximately 28 mm (1-1/8 inches) wide.
 - c. Distance from center line of hinge pin to back of vertical leg shall be 44 mm (1-3/4 inches) or provide for wood spacer if hinge line is at joint of vertical and horizontal leg.

- d. Distance from face to face of bracket when closed shall be 50 mm (2 inches).
 - e. Brackets shall automatically lock when counter is raised parallel to floor and shall unlock manually.
 - f. Each bracket shall support not less than 68 Kg (150 pounds) evenly distributed.
9. Edge Strips Moldings:
- a. Driven type "T" shape with serrated retaining stem; vinyl plastic to match plastic laminate color, stainless steel, or 3 mm (1/8 inch) thick extruded aluminum.
 - b. Stainless steel or extruded aluminum channels.
 - c. Stainless steel, number 4 finish; aluminum, mechanical applied medium satin finish, clear anodized 0.1 mm (0.4 mils) thick.
10. Rubber or Vinyl molding
- a. Rubber or vinyl standard stock and in longest lengths practicable.
 - b. Design for closures at joints with walls and adhesive anchorage.
 - c. Adhesive as recommended by molding manufacturer.
11. Primers: Manufacturer's standard primer for steel providing baked enamel finish.

2.11 MOISTURE CONTENT

- A. Moisture content of lumber and millwork at time of delivery to site.
- 1. Interior finish lumber, trim, and millwork 32 mm (1-1/4 inches) or less in nominal thickness: 12 percent on 85 percent of the pieces and 15 percent on the remainder.
 - 2. Exterior treated or untreated finish lumber and trim 100 mm (4 inches) or less in nominal thickness: 15 percent.
 - 3. Moisture content of other materials shall be in accordance with the standards under which the products are produced.

2.12 FIRE RETARDANT TREATMENT

- A. Where wood members and plywood are specified to be fire retardant treated, the treatment shall be in accordance with Mil. Spec. MIL-L19140.
- B. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings.
- C. Each piece of treated material shall bear identification of the testing agency and shall indicate performance in accordance with such rating of flame spread and smoke developed.

- D. Treat wood for maximum flame spread of 25 and smoke developed of 25.
- E. Fire Resistant Softwood Plywood:
 - 1. Use Grade A, Exterior, plywood for treatment.
 - 2. Meet the following requirements when tested in accordance with ASTM E84.
 - a. Flame spread: 0 to 25.
 - b. Smoke developed: 100 maximum
- F. Fire Resistant Hardwood Plywood:
 - 1. Core: Fire retardant treated softwood plywood.
 - 2. Hardwood face and back veneers untreated,
 - 3. Factory seal panel edges, to prevent loss of fire retardant salts.

2.13 PRESERVATIVE TREATMENT

- A. Wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including wood members used for rough framing of millwork items except heart-wood Redwood and Western Red Cedar shall be preservative treated in accordance with AWPA Standards.
- B. Use Grade A, exterior plywood for treatment.

2.14 ACOUSTICAL PANEL

- A. Performance criteria:
 - 1. NRC 19 mm (3/4 inch) adhesive mounting direct to substrate.
 - 2. Composite flame spread: ASTM E84, 25 or less.
 - 3. Smoke developed: ASTM E84, 140 or less.
- B. Glass fiber panel covered with fabric.
 - 1. Glass fiber panel one inch thick minimum, self-supporting of density required for minimum NRC.
 - 2. Fabric covering treated to resist stains and soil, bonded directly to the glass fiber panel face, flat bonded directly to the glass fiber panel face, flat wrinkle-free surface.
- C. Adhesive: As recommended by panel manufacturers.

2.15 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.
 - 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 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. Mounting Strips, Shelves and Rods:

1. Cut mounting strips from 25 mm by 100 mm (1 by 4 inches) softwood stock, with exposed edge slightly rounded.
2. Cut wood shelf from softwood 1 inch stock, of width shown, exposed edge slightly rounded. Option: Use 19 mm (3/4 inch) thick plywood with 19 mm (3/4 inch) softwood edge nosing on exposed edge, slightly rounded.
3. Plastic laminate covered, 19 mm (3/4 inch) thick plywood or particle board core with edges and ends having plastic molded edge strips. Size, finish and number as shown.

4. Rod or Closet Bar: L03131. Combination Garment and Shelf Support, intermediate support for closet bar: B04051 for rods over 1800 mm (6 feet) long.

D. Communications Center Counter:

1. Fabricate to AWI premium grade construction in conformance with AWI Section 400, CASEWORK.
2. Use softwood for structural framing member's standard sizes, space not over 400 mm (16 inches) on center.
3. Use red oak for exposed hardwood trim and edging.
4. Use drawer guides on drawers with pulls.
5. Use pulls and concealed hinges on doors.
6. Use adjustable shelf standards with shelf rests.
7. Use decorative plastic laminate on exposed surfaces including interior of cupboard cabinet.
8. Overlay frame of apron with drawer and door face.
9. Provide cut outs for electrical devices and outlets.

E. Thru-Wall Counter or Pass Thru Counter.

1. Fabricate counter as shown. Return hardwood edge to metal frame at ends. Fabricate to join other counters where shown.
2. Cut to fit metal frame profile.
3. Fabricate to receive sliding pass window track when shown; specified in Section 08 56 19, PASS WINDOWS.
4. Use angle and fabricated shelf bracket supports.

F. 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. 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°C (70°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 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:

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. 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.

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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. Insulation for insulated wall panels: Section 07 42 16, INSULATED CORE METAL WALL PANELS.
- B. Insulation in connection with roofing and waterproofing: Section 07 22 00, ROOF AND DECK INSULATION.
- 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):
 - C270-10.....Mortar for Unit Masonry
 - C516-08.....Vermiculite Loose Fill Thermal Insulation
 - C549-06.....Perlite Loose Fill Insulation
 - C552-07.....Cellular Glass Thermal Insulation.
 - C553-08.....Mineral Fiber Blanket Thermal Insulation for
Commercial and Industrial Applications
 - C578-10.....Rigid, Cellular Polystyrene Thermal Insulation

C591-09.....Unfaced Preformed Rigid Cellular
Polyisocynurate Thermal Insulation
C612-10.....Mineral Fiber Block and Board Thermal
Insulation
C665-06.....Mineral Fiber Blanket Thermal Insulation for
Light Frame Construction and Manufactured
Housing
C728-05 (R2010).....Perlite Thermal Insulation Board
C954-10.....Steel Drill Screws for the Application of
Gypsum Panel Products or Metal Plaster Base to
Steel Studs From 0.033 (0.84 mm) inch to 0.112
inch (2.84 mm) in thickness
C1002-07.....Steel Self-Piercing Tapping Screws for the
Application of Gypsum Panel Products or Metal
Plaster Bases to Wood Studs or Steel Studs
D312-00(R2006).....Asphalt Used in Roofing
E84-10.....Surface Burning Characteristics of Building
Materials
F1667-11.....Driven Fasteners: Nails, Spikes and Staples.

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL

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

Material Type	Percent by Weight
Perlite composite board	23 percent post consumer recovered paper
Polyisocyanurate/polyurethane	
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.
- C. Mineral Fiber: ASTM C665, Type III, Class A where framing is not faced with gypsum board.

2.3 ACOUSTICAL INSULATION

- A. Mineral Fiber boards: ASTM C553, Type II, flexible, or Type III, semirigid (4.5 pound nominal density).
- B. Mineral Fiber Batt or Blankets: ASTM C665. Maximum flame spread of 25 and smoke development of 450 when tested in accordance with ASTM E84.
- C. Thickness as shown; of widths and lengths to fit tight against framing.

2.4 SOUND DEADENING BOARD

- A. Mineral Fiber Board: ASTM C612, Type IB, 13 mm (1/2 inch thick).
- B. Perlite Board: ASTM C728, 13 mm (1/2 inch thick).

2.5 RIGID INSULATION

- A. On the inside face of exterior walls, spandrel beams, floors, bottom of slabs, and where shown.
- B. Mineral Fiber Board: ASTM C612, Type IB or 2.
- C. Perlite Board: ASTM C728.
- D. Cellular Glass Block: ASTM C552, Type I.

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 (two inches) in diameter.
- C. Impaling Pins: Steel pins with head not less than 50 mm (two inches) in diameter with adhesive for anchorage to substrate. Provide impaling pins of length to extend beyond insulation and retain cap washer when washer is placed on the pin.

2.7 ADHESIVE

- A. As recommended by the manufacturer of the insulation, complying with low emitting materials requirements. See Section 01 81 13.16.
- B. Asphalt: ASTM D312, Type III or IV.
- C. Mortar: ASTM C270, Type 0.

2.8 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 (six inches) apart.
- E. Roof Rafter Insulation or Floor Joist Insulation: Place mineral fiber blankets between framing to provide not less than a 50 mm (two inch) air space between insulation and roof sheathing or subfloor.
- F. Ceiling Insulation and Soffit Insulation:
 - 1. Fasten blanket insulation between wood framing or joist with nails or staples through flanged edges of insulation.
 - 2. At metal framing or ceilings suspension systems, install blanket insulation above suspended ceilings or metal framing at right angles to the main runners or framing. Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.
 - 3. In areas where suspended ceilings adjoin areas without suspended ceilings, install either blanket, batt, or mineral fiberboard extending from the suspended ceiling to underside of deck or slab above. Secure in place to prevent collapse or separation of hung blanket, batt, or board insulation and maintain in vertical position. Secure blanket or batt with continuous cleats to structure above.

3.3 RIGID INSULATION ON SURFACE OF EXTERIOR WALLS, FLOORS, AND UNDERSIDE OF FLOORS

- A. On the interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to the face of studs for interior wall finish where shown.
- B. Bond to solid vertical surfaces with adhesive as recommended by insulation manufacturer. Fill joints with adhesive cement.
- C. Use impaling pins for attachment to underside of horizontal surfaces. Space fastenings as required to hold insulation in place and prevent sagging.
- D. Fasten board insulation to face of studs with screws, nails or staples. Space fastenings not more than 300 mm (12 inches) apart. Stagger fasteners at joints of boards. Install at each corner.
- E. Floor insulation:
 - 1. Bond insulation to concrete floors in attic by coating surfaces with hot steep asphalt applied at rate of not less than 11.5 Kg per m² (25 lbs/100 sq. ft.), and firmly bed insulation therein.

2. When applied in more than one layer, bed succeeding layers in hot steep asphalt applied at the rate of not less than 11.5 Kg per m² per m² lbs/100 sq. ft.).
3. Contractors option: Insulation may be installed with nonflammable adhesive in accordance with the manufacturer's printed instructions when a separate vapor retarder is used.

3.4 ACOUSTICAL INSULATION

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

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

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Roof and deck insulation, substrate board, vapor retarder, 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. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.
- C. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):
 - 90.1-07.....Energy Standard for Buildings Except Low-Rise Residential Buildings
- C. ASTM International (ASTM):
 - C208-08.....Cellulosic Fiber Insulating Board
 - C552-07.....Cellular Glass Thermal Insulation
 - C726-05.....Mineral Fiber Roof Insulation Board
 - C728-05.....Perlite Thermal Insulation Board
 - C1177/C1177M-08.....Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - C1278/C1278M-07.....Standard Specification for Fiber-Reinforced Gypsum Panel
 - C1289-10.....Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - C1396/C1396M-09.....Standard Specification for Gypsum Board

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

1.4 PERFORMANCE REQUIREMENTS

- A. Thermal Performance: Provide roof insulation meeting minimum overall
average R-value of 33, with minimum R-value at any location of 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.
- F. Requirements of applicable Miami-Dade County approval for high-wind zone design.
- G. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Product Data:
 - 1. Asphalt and adhesive materials, each type.
 - 2. Roofing cement, each type.
 - 3. Roof insulation, each type.
 - 4. Substrate board, each type.
 - 5. Cover board, each type.
 - 6. Fastening requirements.
 - 7. 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.
 3. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.
- D. Shop Drawings: Include plans, sections, details, and attachments.
1. Nailers, cants, and terminations.
 2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.
- E. Samples:
1. Roof insulation, each type.
 2. Nails and fasteners, each type.
- F. Certificates:
1. Indicating type, thermal conductance, and minimum and average thickness of insulation.
 2. Indicating materials and method of application of insulation system meet the requirements of FM Approvals for specified roofing system.
- G. Laboratory Test Reports: Thermal values of insulation products.
- H. Layout of tapered roof system showing units required.
- I. Documentation of supervisors' and inspectors' qualifications.

1.7 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.

2 - PRODUCTS

2.1 ADHESIVE MATERIALS

- A. Adhesive Materials, General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
1. Liquid-type adhesive materials shall comply with LEED Low Emitting Materials Credit IEQ 4.1 VOC limits or authorities having jurisdiction VOC limits, whichever is more stringent.
 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content (to meet IEQ 4.1 Low Emitting Materials) when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Multipurpose Construction Adhesives: 70 g/L.
 - c. Fiberglass Adhesives: 80 g/L.
 - d. Contact Adhesives: 80 g/L.
 - e. Other Adhesives: 250 g/L.
 - f. Nonmembrane Roof Sealants: 300 g/L.
 - g. Sealant Primers for Nonporous Substrates: 250 g/L.
 - h. Sealant Primers for Porous Substrates: 775 g/L.
- B. Primer: ASTM D41.
- C. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.
- D. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive

formulated to attach roof insulation to substrate or to another insulation layer.

- E. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- F. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- G. Roof Cement: Asbestos free, ASTM D2822, Type I or Type II, ; or, D4586, Type I or Type II.

2.2 ROOF AND DECK INSULATION

- A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.
- B. Tapered Roof Insulation System:
 - 1. Fabricate of mineral fiberboard, polyisocyanurate, perlite board, or cellular glass. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
 - 2. Cut to provide high and low points with crickets and slopes as shown.
 - 3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
 - 4. Minimum slope 1:48 (1/4 inch per 12 inches).

2.3 INSULATION ACCESSORIES

- A. Glass (Felt): ASTM D2178, Type VI, heavy duty ply sheet.
- B. Vapor Retarder:
 - 1. Glass-Fiber Felts: ASTM D2178, Type IV, asphalt impregnated.
 - 2. Self-Adhering Sheet Vapor Retarder: ASTM D1970, minimum of 1.0-mm- (40-mil-) thick, polyethylene film laminated to layer of rubberized asphalt adhesive, or 0.76- to 1.0-mm- (30- to 40-mil-) thick, polyethylene film laminated to layer of butyl rubber adhesive; maximum permeance rating of 6 ng/Pa x s x sq. m (0.1 perm).
- C. Substrate Board:
 - 1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 13 mm (1/2 inch) Type X, factory primed.

2. Cellulosic-fiber-reinforced, water-resistant gypsum substrate, ASTM 13 mm (1/2 inch) thick.

D. Cover Board:

1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 13 mm (1/2 inch thick, factory primed.
2. Cellulosic-fiber-reinforced, water-resistant gypsum substrate, ASTM C1278/C1278M, 13 mm (1/2 inchthick.

2.4 FASTENERS

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SUBSTRATE BOARD INSTALLATION

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

3.4 VAPOR RETARDER INSTALLATION

A. General:

1. Install continuous vapor retarder on roof decks where indicated.
2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
3. At all pipes, walls, and similar penetrations through vapor retarder, seal openings with roof cement to prevent moisture entry from below.
4. Seal penetrations with roof cement.

B. Steel Deck:

1. Material and method of application of roofing systems used on metal decks shall meet the requirements of FM Approvals for Class I-A Insulated Steel Roof Deck.

2. Attach substrate board and subsequent components to meet the requirements of FM Approval's "RoofNav" listing for specified system meeting Fire/Windstorm Classification indicated in Division 07 roofing section.
3. Locate the long dimension edge joints to have solid bearing on top of decking ribs; do not cantilever over rib openings or flutes.

3.5 RIGID INSULATION INSTALLATION

A. Insulation Installation, General:

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

B. Insulation Thickness:

1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.
2. Insulation on Metal Decks: Provide minimum thickness of insulation for metal decks recommended by the insulation manufacturer to span rib opening (flute size) of metal deck used. Support edges of insulation on metal deck ribs.
3. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, gravel stops, fascias and similar items at no additional cost to the Government.
4. Where tapered insulation is used, the thickness of the insulation at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 38 mm (1-1/2 inches).
5. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).

- C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.
- D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.
- E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.
- F. Cut to fit tight against blocking or penetrations.
- G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.
- H. Installation Method:
 - 1. Mechanically Fastened Insulation:
 - a. Fasten insulation in accordance with FM Approval's "RoofNav" requirement in Division 07 roofing section.
 - b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.
 - 2. Cover Board: Install cover boards over insulation with long joints in continuous straight lines with staggered end joints. Offset cover board joints from insulation joints minimum 150 mm (6 inches). Fasten cover boards according to "Mechanically Fastened Insulation" requirements.

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SECTION 07 42 16
INSULATED CORE METAL WALL PANELS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Insulated Core Metal Wall Panel System:

1. Factory-foamed horizontal metal wall panel system consisting of exterior metal sheet with interior metal liner panel, bonded to factory foamed-in-place core in thermally-separated profile, with factory sealed tongue-and-groove and rainscreen-design pressure-equalized-chamber horizontal joint, and attached to supports using concealed fasteners.

a. System is provided complete with through-tube supports, secondary metal framing, and aluminum window units.

1.2 RELATED SECTIONS

A. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.

B. Division 07 Section "Joint Sealants" for field-applied joint sealants.

C. Division 08 Section "Glazing" for glazing of window units.

1.3 REFERENCES

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

1. AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 500L - Laboratory Methods of Testing

Louvers for Rating

2. AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2605 - Voluntary Specification,

Performance Requirements and Test

Procedures for Superior Performing Organic

Coatings on Aluminum Extrusions and Panels

AAMA 501.1 - Standard Test Method for Water Penetration of Windows,

Curtain Walls and Doors Using Dynamic Pressure

AAMA 501.2 - Quality Assurance and Diagnostic

Water Leakage Field Check of Installed

Storefronts, Curtainwalls and Sloped

Glazing Systems

- AAMA 508 - Voluntary Test Method and Specifications for Pressure
Equalized Rain Screen Wall Cladding Systems
 - AAMA 611 - Voluntary Specification for
Anodized Architectural Aluminum
 - AAMA 620 - Voluntary Specifications for High Performance Organic
Coatings on Coil Coated Architectural
Aluminum Substrates
 - AAMA 621 - Voluntary Specifications for High Performance Organic
Coatings on Coil Coated Architectural Hot Dipped
Galvanized (HDG) & Zinc-Aluminum Coated Steel
Substrates
3. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
- ASCE 7-05 - Minimum Design Loads for Buildings and Other Structures
4. ASTM INTERNATIONAL (ASTM)
- ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-
Coated (Galvanized) or Zinc-Iron Alloy-Coated
(Galvannealed) by the Hot-Dip Process
 - ASTM A 666 - Standard Specification for Annealed or Cold-Worked
Austenitic Stainless Steel Sheet, Strip, Plate
and Flat Bar
 - ASTM A 755/A 755M - Standard Specification for Steel Sheet, Metallic
Coated by the Hot-Dip Process and Prepainted by
the Coil-Coating Process for Exterior Exposed
Building Products
 - ASTM B 117 - Standard Practice for Operating Salt Spray (Fog)
Apparatus
 - ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy
Sheet and Plate
 - ASTM C 1363 - Standard Test Method for Thermal Performance of Building
Materials and Envelope Assemblies by Means of a
Hot Box Apparatus
 - ASTM C 209 - Standard Test Methods for Cellulosic Fiber Insulating
Board
 - ASTM C 645 - Nonstructural Steel Framing Members
 - ASTM C 754 - Installation of Steel Framing Members to Receive Screw-
Attached Gypsum Panel Products

- ASTM D 3359 - Measuring Adhesion by Tape Test
 - ASTM D 4585 - Standard Practice for Testing Water Resistance of
Coatings Using Controlled Condensation
 - ASTM D 4587 - Standard Practice for Fluorescent UV-Condensation
Exposures of Paint and Related Coatings
 - ASTM D 968 - Abrasion Resistance of Organic Coatings by Falling
Abrasive
 - ASTM E 119 - Standard Test Methods for Fire Tests of Building
Construction and Materials
 - ASTM E 1592 - Structural Performance of Sheet Metal Roof and Siding
Systems by Uniform Static Air Pressure Difference
 - ASTM E 1886 - Standard Test Method for Performance of Exterior
Windows, Curtain Walls, Doors, and Impact
Protective Systems Impacted by Missile(s) and
Exposed to Cyclic Pressure Differentials
 - ASTM E 1996 - Standard Specification for Performance of Exterior
Windows, Curtain Walls, Doors, and Impact
Protective Systems Impacted by Windborne Debris
in Hurricanes
 - ASTM E 283 - Determining the Rate of Air Leakage Through Exterior
Windows, Curtain Walls, and Doors Under Specified
Pressure Differences Across the Specimen
 - ASTM E 329 - Standard Specification for Agencies
Engaged in the Testing and/or Inspection
of Materials Used in Construction
 - ASTM E 331 - Water Penetration of Exterior Windows, Skylights, Doors,
and Curtain Walls by Uniform Static Air Pressure
Difference
 - ASTM E 72 - Conducting Strength Tests of Panels for Building
Construction
 - ASTM E 84 - Standard Test Method for Surface Burning Characteristics
of Building Materials
5. ANSI/FM GLOBAL (ANSI/FM)
- ANSI/FM 4880 - Standard for Evaluating Insulated Wall & Roof/Ceiling
Assemblies

6. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285 - Standard Fire Test Method for Evaluation of Fire

Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

7. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA 1793 - Architectural Sheet Metal Manual, Sixth Edition, Second Printing

8. U.S. GREEN BUILDING COUNCIL (USGBC)

LEED - Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction
(LEED-NC)

9. UNDERWRITERS LABORATORIES (UL)

UL 1715 - Fire Test of Interior Finish Material

UL 263 - Fire Tests of Building Construction and Materials

UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials

UL Bld Mat Dir - Building Materials Directory

UL Fire Resistance - Fire Resistance Directory

1.4 PERFORMANCE REQUIREMENTS

Provide metal wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

A. Delegated Design: Engage a qualified engineer to provide design and engineering analysis of composite wall panel system including secondary framing based on Project performance requirements and design criteria.

B. Air Infiltration: Maximum 0.06 cfm/sq. ft. air infiltration per ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft., using minimum 10-by-10 foot test panel that includes horizontal and vertical joints.

C. Water Penetration, Static Pressure: No uncontrolled water penetration per ASTM E 331 at a minimum static differential pressure of 40 lbf/sq. ft.,

using minimum 10-by-10 foot test panel that includes horizontal and vertical joints in a laboratory mockup.

- D. Water Penetration, Dynamic Pressure: No uncontrolled water penetration per AAMA 501.1 at a minimum static differential pressure of 15 lbf/sq. ft., using minimum 10-by-10 foot test panel that includes horizontal and vertical joints.
- E. System Performance: Horizontal joint design shall meet minimum performance criteria per AAMA 508-07, which includes static and dynamic testing with imperfect air barriers. A third party test indicating successful passing of this test must be submitted prior to bid.
 - 1. Bidders supplying Panel systems that have not successfully passed AAMA 508-07 shall provide a backup system consisting of 5/8" exterior grade gypsum and a membrane that meets the air and water infiltration values as listed in above in section 1.4 A & 1.4 B.
- F. Water Absorption: Maximum 1.0 percent absorption rate by volume when tested according to ASTM C 209.
- G. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, per ASTM E 72 and complying with the load and stress requirements in accordance with ASTM E 1592. Wind Load force due to wind action governs the design for panels. Submit wind load tests and seismic tests to the Contracting Officer.
 - 1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings or calculated per IBC 2006 whichever is more stringent.
 - 2. Limits of Deflection: Composite wall panel system shall withstand scheduled wind pressure with the following allowable deflection:
 - a. Maximum allowable deflection limited to L/175 deflection of panel perimeter normal to plane of wall with no evidence of failure.
 - 3. Secondary Metal Framing: Design secondary metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions". Provide minimum 3-inch-wide bearing surface for metal wall panels at the following locations:
 - a. Horizontal Panel System: At vertical joints.
 - 4. Windborne-Debris-Impact-Resistance Performance: Pass missile-impact and cyclic-pressure tests per ASTM E 1886 and ASTM E 1996 for Wind Zone indicated on Drawings.
 - a. Large-Missile Test: For openings located within 30 feet of grade.

- b. Small-Missile Test: For openings located more than 30 feet above grade.
- 5. Seismic Performance: Comply with ASCE 7-05 Section 9, "Earthquake Loads."
- H. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.
- I. Thermal Performance: Thermal-resistance (R) value indicated, per ASTM C 1363.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's data sheets for metal wall panel system and accessories.
- B. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.
- C. LEED Submittals: Credit MR 4.1/MR4.2, Manufacturer's Product Data indicating the following:
 - 1. Percentages by weight of post-consumer and pre-consumer recycled content.
 - 2. Indicate total weight of products provided.
- D. Cradle to Cradle Certification: Manufacturer to submit evidence of a minimum of a silver level Cradle-to-Cradle Certification from MBDC. Panel systems that do not meet Cradle to Cradle Certification shall submit a third party certification of compliance prior to bidding for the following items:
 - 1. The protective strippable coating on the panel exterior contains no PVC.
 - 2. Panels shall have a minimum Nutrient Reutilization Score (as defined by MBDC) of 50.
 - 3. For steel faced panels the recycled content is a minimum 25%.
 - 4. The quantity of energy used to produce the panels (on a square foot basis) shall be documented and certified.
 - 5. The facility that manufactures the panels shall show evidence of creation and adoption of a specific set of Water Stewardship Guidelines, based on the World Business Council for Sustainable Development or the Hannover Principles - Design for Sustainability. These water Stewardship Guidelines shall be signed by the company president.
- E. Shop Drawings: Prepared by manufacturer or factory trained authorized

dealer. Include elevations showing metal wall panels, and details of each condition of installation and attachment. Indicate coordination dimensions related to structural support system elements provided by others.

- F. Include structural data indicating compliance with performance requirements
- G. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- H. Qualification Information: For Installer firm, proof of installer's manufacturer trained field supervisor.
- I. Warranty: Submit proposed warranty meeting requirements of this Section.

1.6 QUALITY ASSURANCE

- A. Qualification of Manufacturer: Metal wall panel system manufacturer must have a minimum of five (5) years experience in manufacturing metal wall system and accessory products.
- B. Qualification of Engineer: Provide engineering services by an authorized engineer; currently licensed in the geographical area where construction will take place, having a minimum of four (4) years experience as an engineer knowledgeable in wind load design analysis, protocols and procedures for ASCE 7-05 and ASTM E 1592. Provide certified engineering calculations using the products submitted for: Wind load requirements in accordance with FM Wind Design Guide and ASCE 7-05.
- C. Qualification of Installer: The installation contractor must be approved and certified by the wall panel manufacturer prior to beginning the installation of the metal wall system.
- D. Testing Agency Qualifications: Qualify in accordance with requirements of ASTM E 329.
- E. Adhesion Test: Prior to delivery of composite wall panel system, perform test on adhesives and sealants per ASTM D 3359. Test each adhesive and sealant utilizing specified panel finish.
 - 1. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as specified in Division 07 Section "Joint Sealants."
- F. Fire Performance Characteristics: Provide metal composite wall systems with the following fire-test characteristics determined by indicated test standard as applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Surface-Burning Characteristics: Provide metal composite wall system panels with the following characteristics when tested per ASTM E 84 or UL 723.
 2. Flame spread index: 25 or less.
 2. Smoke developed index: 450 or less.
 3. Fire Performance of Insulated Wall: Class 1 wall panel per 3NSI/FM 4880.
 4. Room Corner Test: NFPA 285 or UL 1715.
 5. Intermediate Scale Multistory Fire Test: Representative mockup tested per NFPA 285.
- G. Mockups: Build mockup in size and location indicated. Show details of composite wall panel system. Demonstrate methods and details of installation. Show details of gasketed return vertical joints, penetrations, doors, windows, louvers, pipe openings, inside and outside corners, top and bottom of wall, horizontal and vertical joints.
1. Perform water spray test of mockup to demonstrate working principles of rainscreen design.
 2. Approval of mockup does not relieve Contractor of responsibility to comply with all requirements of contract documents.
 3. Approved mockup may become part of installation if approved by Architect.

1.7 ADMINISTRATIVE REQUIREMENTS

- A Pre-installation Conference: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's technical representative, and other trade contractors, to review the following:
1. Coordinate building framing in relation to composite wall panel system.
 2. Coordinate installation of building air and water barrier behind composite wall panel system.
 3. Coordinate window, door and other openings and penetrations of composite wall panel system.
 4. Review drawings, including Fabrication and Installation drawings, showing complete Wall Panel Assemblies, and specifications. Include review of submittal items as applicable for the following:
 - a. Flashing and accessories
 - b. Anchorage systems
 - c. Manufacturer's catalog data

- d. Factory Color Finish
 - e. Insulation
 - f. Closure Materials, including metal closure strips.
 - g. Flashing Tape
 - h. Fasteners
5. Finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 6. Methods and procedures related to metal wall panel installation, including manufacturer's written instructions for Installation of Wall panels, and verification of wall system assembly wind load.
 7. Support conditions for compliance with requirements, including alignment between and attachment to structural members. Provide details of wind design analysis including wind speed, exposure category, co-efficient, importance factor, designates type of facility, negative pressures for each zone, methods and requirements of attachment. Wind design analysis to include wall plan delineating dimensions and attachment patterns for each zone. Wind design analysis to be prepared and sealed by Licensed Project Engineer in the geographic area where the construction will take place.
 8. Flashing, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 9. Governing regulations and requirements for insurance, certificates, tests and inspections if applicable. Include review of Sustainable Design Requirements, and wall system assembly wind load. Safety plan review must include applicable Material Safety Data Sheets.
 10. Temporary protection requirements for metal wall panel assembly during and after installation.
 11. Wall panel observation and repair procedures after metal wall panel installation. Include review of sample repair paint.
 12. Sample Warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect products of composite wall panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.
 1. Deliver, unload, store, and erect composite wall panel system and accessory items without misshaping panels or exposing panels to surface

damage from weather or construction operations.

1.9 WARRANTY

- A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal wall panel assemblies and integrated window units that fail in materials and workmanship within two years from date of Substantial Completion.
- B. Special Panel Finish Warranty: Manufacturer's standard form, in which manufacturer agrees to repair or replace wall panels that evidence deterioration of fluoropolymer finish within 20 years from date of Substantial Completion.

1.10 SUSTAINABLE DESIGN REQUIREMENTS

- A. Regional Materials: Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Wall panel system materials may be locally available.
- B. Recycled Content: Use materials with an average postconsumer recycled content plus one-half of preconsumer recycled content that is not less than 50 percent. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Wall panel systems may contain post-consumer or post-industrial recycled content.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: CENTRIA, Formawall Insulated Core Metal Wall Panels, Dimension Series Horizontal Flat, 3"-T and 2"-T where occur, and integrated FV 400 Horizontal Aluminum windows, 2-1/2" mullions with 1" insulating glass.

CENTRIA Architectural Systems; Moon Township, PA 15108-2944.

Tel: (800)759-7474. Tel: (412)299-8000. Fax: (412)299-8317.

Email: info@CENTRIA.com. Web: www.CENTRIA.com

- B. Subject to compliance with requirements, provide a comparable product by a qualified manufacturer meeting the project requirements. No substitution will be considered unless the architect has received a request for approval as required in SECTION 001631 - SUBSTITUTIONS.

2.2 FOAMED INSULATION CORE METAL WALL PANELS

- A. Panel System Product:

1. CENTRIA, FormaWall Dimension Series 2 and 3 Flat Panels (2 inches and 3 inches thick panels).
2. Foamed Insulation Core: Urethane or isocyanurate, density 2.7 lb/cu. ft. min (43.4 kg/cu. m), min compressive strength 20 lb/sq. in. (137.9 kPa), and containing no CFC or HCFC compounds.
3. Thermal performance of the wall panels shall be based on tests in accordance with ASTM C236 corrected to 15 mph outside and still air inside. Tests shall include side-joint, standard fastening and integral reveals or profiling. Where reveals exceed the standards, the manufacturer shall provide similar testing to document any adjustments required to the standard conditions.
 - a. R value for Series 2 flat panel shall be 14.
 - b. R value for Series 3 flat panel shall be 20.
- B. Steel Sheet Exterior and Interior Facing: Contractor engineered panel meeting requirements indicated in Performance Requirements Article.
- C. Liner Sheet: G-90 coating, embossed, planked with 0.2 mil primer and 0.6 mil acrylic finish. Gage as determined by Contractor engineering.
- D. Panel System Design:
 1. Panel Joinery:
 - a. Vertical Panel Joint Configuration: Double tongue-and- groove.
 - b. Horizontal Panel Joint Configuration: Rain screen design with equalized pressure chamber.
 2. Panel Width and Length: Refer to the Drawings.
 3. Panel Reveal Depth: Horizontal panel reveal depth to be a minimum of 1-3/16 inches (30 mm).
 4. Panel Reveal Width: Horizontal panel reveal width to be 1/2" for horizontal joints.
 5. Formed Corners: Corner panels are to be factory formed-in- place and factory notched and bent. No exterior flashing or extruded trim to be accepted in lieu of formed corners except as noted on the drawings. All exposed notches must be sealed.
 6. Insulated Core Metal Wall Panel System: Factory-foamed-in- place horizontal panel system consisting of exterior metal face sheet with interior metal liner panel, bonded to factory foamed-in-place core in thermally-separated profile, utilizing no glues or adhesives, with factory sealed tongue-and-groove and pressure-equalized rainscreen-designed horizontal joint, attached to supports using concealed fasteners.

2.3 MATERIALS

- A. Metallic-Coated Steel Face Sheet, Coil Coated: ASTM A 755/A 755M.
 - 1. Zinc-Coated (Galvanized) Steel Face Sheet: ASTM A 653/A 653M, G90, structural quality.
 - a. Finish: DURAGUARD for improved corrosion resistance consisting of 0.8 mil primer with 0.8 mil 70 percent PVDF fluoropolymer color coat. Color to be #9912 "Sage Brown" at Flat Panels, to match existing panels adjacent Outpatient Mental Health Building.

2.4 ACCESSORIES

- A. Metal Wall Panel Accessories:
 - 1. Provide complete metal wall panel assembly including trim, copings, fascia, parapet caps, soffits, sills, inside and outside corners, jambs, returns, and all miscellaneous flashings. Include required fasteners, gaskets, closure strips, and sealants.
 - 2. Fabricate accessories listed above from aluminum extrusions, 6063-T5 unless noted otherwise on the Drawings.
 - 3. Finish exposed trim and extrusions to adjacent match panels unless noted otherwise on the Drawings.
 - 4. Provide all indicated extrusions with thermal breaks.

2.5 MISCELLANEOUS MATERIALS

- A. Sealant: Synthetic non-skinning butyl rubber sealant, as recommended by panel manufacturer, for metal wall panel assemblies to remain watertight.
- B. Fasteners: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal wall panels by means factory-applied coating.

2.6 INTEGRATED WINDOW SYSTEM

- A. Integrated Window Units: Thermally-improved fixed aluminum window units designed to integrate with metal wall panel profile and secondary support system without receptor channels or other flashing, with rain screen and pressure equalization design meeting system requirements. Sash accepts 1 inch insulating glass units.
- B. Integrated Window System With through-tube supports for panels and strip windows:
 - 1. System Depth: 6-5/8 inch, with steel through-tube supports.
 - 2. Sightlines: Head: 2-1/2 inch; Sill: 2-1/2 inch; Mullions: 2 1/2 inch.
 - 3. Exterior pressure bar glazing with snap-on cover.
 - 4. Integral gutter at window head and panel base.

- C. Configuration: Strip window and stacked glass as indicated.
- D. Mullions: Full.
- E. Frame: Thermally-improved 6063-T5 or 6560-T5 aluminum extrusion, outside glazed.
- F. Finish, Exterior
 - 1. Match metal wall panel finish.
- G. Finish, Interior
 - 1. Match metal wall panel finish.
- H. Glazing: 1 inch insulating glass, as specified in Section 08 81 00 GLAZING.

2.7 INTEGRATED THROUGH-TUBE SUPPORTS

- A. Steel vertical tube structural supports for metal wall panel system, coordinated with panel system components, engineered to meet project structural design requirements.
 - 1. Size: As indicated on approved shop drawings.

2.8 SECONDARY METAL FRAMING

- A. Miscellaneous Framing Components, General: Cold-formed metallic-coated steel sheet, ASTM C 645, Grade 50, with ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating.
- B. Subgirts: C- or Z- shaped sections, 0.064-inch minimum.
- C. Sill Channels: 0.064-inch minimum.
- D. Hat Channels: 0.040 inch minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine metal wall panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.
- B. Framing: Inspect framing that will support metal wall panels to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal wall panels.
- C. Wall Sheathing: Confirm that wall sheathing is within tolerances acceptable to metal wall panel system manufacturer.
 - 1. Maximum deviations acceptable:
 - a. 1/4-inch in 20 feet vertically or horizontally from face plane of framing.
 - b. 1/2-inch maximum deviation from framing face plane on any building

elevation.

c. 1/8-inch in 5 feet.

- D. Openings: Verify that window, door, louver and other penetrations match layout on shop drawings.
- E. Air/Moisture Barriers: Confirm that work has been completed, inspected, and tested as required.
- F. Correction: Correct out-of-tolerance work and other deficient conditions prior to proceeding with metal wall panel system installation.

3.2 PREPARATION

- A. Install miscellaneous framing and anchorage according to ASTM C 754, metal wall panel manufacturer's written recommendations, and approved shop drawings.

3.3 METAL WALL PANEL INSTALLATION

- A. Install metal wall panels and accessories in accordance with manufacturer's recommendations and approved shop drawings.
- B. General: Install metal wall panels in orientation, sizes, and locations indicated. Anchor metal wall panels and other components securely in place. Provide for thermal and structural movement.
 - 1. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as approved by manufacturer.
 - 2. Field cutting of metal wall panels is not permitted.
 - 3. Fasten metal wall panels to supports with concealed clips at each joint at location, spacing, and with fasteners recommended by manufacturer. Install clips to supports with self-tapping fasteners.
 - 4. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- C. Fasteners for Steel Wall Panels:
 - 1. Exterior: Stainless-steel.
 - 2. Interior: Carbon steel.
- D. Metal Protection: Provide metal wall panel manufacturer's recommended permanent separation material where dissimilar metals will contact each other or corrosive substrates.
- E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies.
 - 1. Seal metal wall panel end laps to supports or back-up flashing sealant, full width of panel. Seal side joints where recommended by

metal wall panel manufacturer. Do not install sealant in locations that will interfere with drainage of pressure-equalized panel chambers.

2. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants."

3.4 ACCESSORY INSTALLATION

- A. General: Install metal wall panel accessories with positive anchorage to building and weather tight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install related flashings and sheet metal trim per requirements of Division 07 Section "Sheet Metal Flashing and Trim."
 2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 3. Comply with performance requirements and manufacturer's written installation instructions.
 4. Provide concealed fasteners except where noted on approved shop drawings.
 5. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.5 INTEGRATED UNIT INSTALLATION

- A. Install through-tube supports, and window units in accordance with manufacturer's recommendations and approved shop drawings. Anchor supports to structure with approved anchors. Assemble wall components using gaskets, fasteners, and trim supplied by metal wall panel manufacturer. Separate dissimilar metals with bituminous coating.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: An independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.
- B. Water-Spray Test: After completing portion of metal wall panel assembly including accessories and trim, test 2-bay area selected by Architect for water penetration, according to AAMA 501.2. Wall areas should be tested as a routine QA procedure. Areas erected by each crew should be checked at various stages of erection.
- C. Manufacturer's Field Service: Engage a service representative authorized by metal wall panel manufacturer to inspect completed installation.

Submit written report. Correct deficiencies noted in report.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.
- B. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

- - - E N D - - -

SECTION 07 53 23
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

PART 1 GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

- A. Treated wood framing, blocking, and nailers: Section 06 10 00, ROUGH CARPENTRY.
- B. Roof Insulation: Section 07 22 00, ROOF AND DECK INSULATION.
- C. Metal cap flashings, copings, fascias, and expansion joints: Section 07 60 00, FLASHING AND SHEET METAL.
- D. Roof hatches, equipment supports, dome type skylights, and gravity ventilators: Section 07 72 00, ROOF ACCESORIES.
- E. Mechanical equipment supports: Section 23 34 00, HVAC FANS and Section 23 31 00, HVAC DUCTS AND CASINGS, Section 23 37 00, AIR OUTLETS AND INLETS.

1.3 QUALITY ASSURANCE

- A. Approved applicator by the membrane roofing system manufacturer, and certified by the manufacturer as having the necessary expertise to install the specific system.
- B. Pre-Roofing Meeting:
 - 1. Upon completion of roof deck installation and prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and Resident Engineer,
 - 2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
 - 3. Inspect roof deck at this time to:
 - a. Verify that work of other trades which penetrates roof deck is completed.
 - b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing

or cause a roof failure.

- c. Examine samples and installation instructions of manufacturer.
- d. Perform pull out test of fasteners (See paragraph 3.2).

1.4 SUBMITTALS

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

1.5 DELIVERY, STORAGE AND HANDLING

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

1.6 WARRANTY

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

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
 - D751-06.....Coated Fabrics
 - D2103-10.....Polyethylene Film and Sheeting
 - D2240-05(R2010).....Rubber Property - Durometer Hardness
 - D3884-09.....Abrasive Resistance of Textile Fabrics

(Rotary Platform, Double-Head Method)

D4637-10.....EPDM Sheet Used in Single-Ply Roof Membrane
D4586-07.....Asphalt Roof Cement, Asbestos Free
E96-10.....Water Vapor Transmission of Materials
E108-10.....Fire Tests of Roof Coverings
G21-09.....Resistance of Synthetic Polymeric Materials to
Fungi

C. National Roofing Contractors Association (NRCA):

Fifth Edition - 05.....The NRCA Roofing and Waterproofing Manual.

D. Federal Specifications (Fed. Spec.)

FF-S-107C(2).....Screws, Tapping and Drive

FF-S-111D(1).....Screw, Wood

UU-B-790A.....Building Paper, Vegetable Fiber

(Kraft, Waterproofed, Water Repellent
and Fire Resistant)

E. Factory Mutual Engineering and Research Corporation (FM): Annual
Issue.....Approval Guide Building Materials

F. Underwriters Laboratories, Inc (UL):

Annual Issue.....Building Materials Directory

Annual Issue.....Fire Resistance Directory

G. Warnock Hersey (WH):

Annual Issue.....Certification Listings

PART 2 - PRODUCTS

2.1 EPDM SHEET ROOFING

A. Conform to ASTM D4637, Type I, Grade 1, white color.

B. Additional Properties:

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

C. Thickness:

1. Use 1.14 mm (0.045-inch) thick sheet for adhered system.
 2. Use 1.5 mm (0.060-inch) thick sheet for mechanically anchored system.
- D. Pipe Boots: inch) minimum height.
1. Color same as roof membrane.

2.2 EPDM FLASHING SHEET

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

2.3 MISCELLANEOUS ROOFING MEMBRANE MATERIALS

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

2.4 FASTENERS

- A. Fasteners and washers required for securing sheet roofing to deck:
 1. Steel stress plate washers as required by sheet roofing manufacturer:
 - a. Coated against corrosion.
 - b. Separate or attached to fastener.
 - c. Approximately 50 mm (2 inch) diameter or 40 mm x 65 mm (1-1/2 by 2-1/2 inches) rectangular plate with rounded corners, minimum thickness 0.6 mm (0.023-inch).
 2. Fastening strip or batten strip for securing roof membrane to deck:
 - a. Stainless steel strip: ASTM A167 type 302 or 304, minimum 0.5 mm (0.018-inch) thick.
 - b. Aluminum strip: ASTM B209, minimum 2.4 mm (0.094-inch) thick.
 - c. Rounded corners on strips.
 - d. Form strips 38 mm (1-1/2 inches) wide, 3000 mm (10 feet) maximum length with 6 mm x 10 mm (1/4 by 3/8 inch) punched slotted holes

- at 100 mm (4 inch) centers; centered on width of strip. Punch holes 2 mm (1/16 inch) larger than fastener shank when shank is larger than 5 mm (3/16 inch).
3. Steel decks: Screws; Fed Spec FF-S-107, hardened nylon screw or steel screw coated to resist corrosion, self drilling, anti-backout thread penetration of 13 mm (1/2 inch).
 4. Gypsum, Insulating Concrete, and Structural Cement Fiber Decks: Diverging or hooking point fastener, anti-spin fitting; or specifically designed for anchorage to deck as recommended by roofing membrane manufacturer, coated to resist corrosion, minimum pullout resistance of 200 Kg (450 pounds).
 5. Concrete and Masonry Wall Surfaces:
 - a. Nail penetration 13 mm (1/2 inch).
 6. Wood:
 - a. Screws; Fed. Spec. FF-S-111, Type I, Style 2.5, coated to resist corrosion, length to provide 19 mm (3/4 inch) minimum penetration.
 - b. Nails: Barbed shank, galvanized.
 7. Washers: Neoprene backed metal washer 28 mm (1-1/8 inch) minimum diameter.
 8. To Sheet Metal: Self tapping screw; Fed. Spec. FF-S-107, 2 mm (No. 14), sheet metal screw, minimum thread penetration of 6 mm (1/4 inch); stainless steel.
- B. Pipe Compression Clamp or Drawband:
1. Stainless steel or cadmium plated steel drawband.
 2. Worm drive clamp device.
- C. Surface mounted base flashing clamp strip:
1. Stainless steel strip, ASTM A167, type 302 or 304, dead soft temper, minimum 0.5 mm (0.018-inch) thick.
 2. Aluminum strip: ASTM B209 24 mm (.094-inch) thick.
 3. For exposed location, form strips with 6 mm (1/4 inch) wide top edge bent out 45 degrees (for sealant) from 40 mm (1-1/2 inch) wide material; 2400 mm (8 feet) maximum length with slotted 6 mm x 10 mm (1/4 by 3/8-inch) holes punched at 200 mm (8 inch) centers, centered between bend and bottom edges.
 4. For locations covered by cap flashings, form strips 30 mm (1-1/4 inch) wide, 2400 mm (8 feet) maximum length with slotted holes 6 mm x 10 mm (1/4 by 3/8 inch) punched at 200 mm (8 inch) centers, centered on strip width.

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

2.5 VAPOR RETARDER OR SEPARATION SHEETS

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

2.6 FLEXIBLE TUBING

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

2.7 WALKWAY PADS

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

2.8 PROTECTION MAT OR SEPARATION SHEETS

- A. Protection Mat:
 - 1. Water pervious; either woven or non-woven pervious sheet of long chain polymeric filaments or yarns such as polypropylene, black polyethylene, polyester, or polyamide; or, polyvinylidene-chloride formed into a pattern with distinct and measurable openings.
 - 2. Filter fabric equivalent opening size (EOS): Not finer than the U.S.A. Standard Sieve Number 120 and not coarser than the U.S.A. Standard Sieve Number 100. EOS is defined as the number of the U.S.A. Standard Sieve having openings closest in size to the filter cloth openings.
 - 3. Edges of fabric selvaged or otherwise finished to prevent raveling.

4. Abrasion resistance:
 - a. After being abraded in conformance with ASTM D3884 using rubber-hose abrasive wheels with one kg load per wheel and 1000 revolutions, perform tensile strength test as specified in ASTM D1682, paragraph.
 - b. Result; 25 kg (55 pounds) minimum in any principle direction.
5. Puncture strength:
 - a. ASTM D751 - tension testing machine with ring clamp; steel ball replaced with a 8 mm (5/16 inch) diameter solid steel cylinder with a hemispherical tip centered within the ring clamp.
 - b. Result; 57 kg (125 pounds) minimum.
6. Non-degrading under a wet or humid condition within minimum 4°C (40°F) to maximum 66°C (150°F) when exposed to ultraviolet light.
7. Minimum sheet width: 2400 mm (8 feet).

PART 3 - EXECUTION

3.1 GENERAL

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

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

3.2 PREPARATION

- A. Test pull out resistance of fasteners in deck in the presence of the Resident Engineer before starting roofing work. Tests are not required for wood.
 - 1. Test applicable fastener type in applicable deck.
 - 2. Install fasteners through a sample of the insulation, if any is to be used, into the structural deck.
 - 3. Test the pull out resistance with a pull out tester.
 - 4. Test one fastener in each deck level and one for every 230 m² (2500 square feet) of deck type and level.
 - 5. Test at locations designated by Resident Engineer.
 - 6. Do not proceed with the roofing work if the pull out resistance of the fasteners is less than specified.
 - 7. Test results:
 - a. Repeat tests using other type fasteners or use additional fasteners to stay within the pullout load resistance criteria.
 - b. Patch cementitious deck to repair areas of fastener tests holes.
- B. Remove dirt, debris, and surface moisture. Cover or fill voids greater than 6 mm (1/4 inch) wide to provide solid support for roof membrane.
- C. Install separation sheet over bituminous material on deck surface lapping edges and ends 150 mm (6 inches) or as recommended by roof membrane manufacturer.
 - 1. Do not install of separation sheet beyond what can be covered by roofing membrane each day.
 - 2. Use polyethylene, or building paper, that will be compatible with seaming method.
 - 3. Insure separation sheet completely isolates bituminous materials from EPDM roofing membrane.
 - 4. Turn up at penetrations, or other surfaces where bituminous materials occur, to cover bituminous product.
 - 5. Turn down over edges of blocking at perimeters to cover blocking.

3.3 INSTALLATION OF ROOFING AND FLASHING

- A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with EPDM roofing membrane.
- B. If possible, install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.
- C. If possible, start at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the

edges of the sheet. Start at high point of metal decks without insulation. Coordinate with roof insulation installation.

- D. Position the membrane so it is free of buckles and wrinkles.
- E. Roll sheet out on deck; inspect for defects as sheet is being rolled out and remove defective areas:
 - 1. Allow 30 minutes for relaxing before proceeding.
 - 2. Lap edges and ends of sheets 75 mm (3 inches) or more as recommended by the manufacturer. Clean lap surfaces as specified by manufacturer.
 - 3. Adhesively splice laps. Apply pressure as required. Seam strength of laps as required by ASTM D4637.
 - 4. Check seams to ensure continuous adhesion and correct defects.
 - 5. Finish edges of laps with a continuous beveled bead of lap sealant to sheet edges to provide smooth transition as specified by manufacturer.
 - 6. Finish seams as the membrane is being installed (same day).
 - 7. Anchor perimeter to deck or wall as specified.
- F. Membrane Perimeter Anchorage:
 - 1. Install batten strip or steel stress plate with fasteners at the perimeter of each roof level, curb flashing, expansion joints and similar penetrations as indicated in accordance with membrane manufacturer's instructions on top of roof membrane to wall or deck.
 - 2. Mechanically fastened as follows:
 - a. Top of mechanical fastener set flush with top surface of the nailing strip or stress plate.
 - b. Space mechanical fasteners a maximum 300 mm (12 inches) on center.
 - c. Start 25 mm (1 inch) from the end of the nailing strip when used.
 - d. When strip is cut round edge and corners before installing.
 - e. Set fasteners in lap sealant and cover fastener head with fastener sealer including batten strip or stress plate.
 - f. Stop fastening strip where the use of the nailing strip interferes with the flow of the surface water, separate by a 150 mm (6 inch) space, then start again.
 - g. After mechanically fastening cover and seal with a 225 mm (9 inch) wide strip of flashing sheet. Use splice adhesive on all

laps and finish edge with sealant as specified.

- h. At fascia-cants turn the membrane down over the front edge of the blocking, cant, or the nailer to below blocking. Secure the membrane to the vertical portion of the nailer; with fasteners spaced not over 150 mm (6 inches) on centers.
- i. At parapet walls intersecting building walls and curbs, secure the membrane to the structural deck with fasteners 150 mm (6 inches) on center or as shown in NRCA manual (Fifth Edition)

G. Adhered System:

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

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

I. Flashing Roof Drains:

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

J. Installing EPDM Base Flashing and Pipe Flashing:

- 1. Install EPDM flashing membranes to pipes, walls or curbs to a height not less than 200 mm (8 inches) above roof surfaces and 100 mm (4 inches) on roof membranes. Install in accordance with NRCA manual:

- a. Adhere flashing to pipe, wall or curb with bonding adhesive.
 - b. Form inside and outside corners of EPDM flashing membrane in accordance with NRCA manual (Fifth Edition). Form pipe flashing in accordance with NRCA manual (Fifth Edition).
 - c. Lap ends not less than 100 mm (4 inches).
 - d. Adhesively splice flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.
2. Anchor top of flashing to walls or curbs with fasteners spaced not over 150 mm (6 inches) on center. Use surface mounted fastening strip with sealant on ducts. Use pipe clamps on pipes or other round penetrations.
 3. Apply sealant to top edge of flashing.
- K. Installing Building Expansion Joints:
1. Install base flashing on curbs as specified.
 2. Coordinate installation with metal expansion joint cover or roof expansion joint system.
- L. Repairs to membrane and flashings:
1. Remove sections of EPDM sheet roofing or flashing that is creased wrinkled or fishmouthed.
 2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (4 inches) beyond damaged, cut, or removed area. Adhesively splice to roof membrane or flashing. Finish edge of lap with sealant as specified.

3.4 WALKWAY PADS

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

3.5 FIELD QUALITY CONTROL

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

seams.

3. Failure of the samples to maintain the standard of quality within a reasonable tolerance of the approved samples will be cause for rejection of the work.

- D. Repair areas of welded seams where samples have been taken or marginal bond voids or skips occur.
- E. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (4 inches) beyond cut.

3.6 TEMPORARY ROOF

- A. Install temporary roof when sequences of work or weather does not permit installation of a completed permanent roof system or roof would be subject to phasing of roof work, construction traffic, scaffolds, and work over roof area.
- B. Use of 1.15 mm (0.045-inch) thick non-reinforced EPDM membrane or other temporary membrane as approved.
- C. Install not less than 6 mm (1/4 inch) thick plywood underlayment over steel decks before installing temporary roof.
- D. Secure membrane to deck with mechanical fasteners or temporary ballast not exceeding deck dead load capacity.
- E. Repair cuts, tears, and punctures with patches to keep system watertight.
- F. Install permanent roof system within one year.

- - - E N D - - -

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

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

- A. Manufactured flashing, copings, roof edge metal, and fasciae: Section 07 72 00 ROOF ACCESSORIES.
- B. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.
- C. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- D. Color of factory coated exterior architectural metal and anodized aluminum items: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Integral flashing components of manufactured roof specialties and accessories or equipment: Section 07 72 00, ROOF ACCESSORIES, Division 22, PLUMBING sections and Division 23 HVAC sections.
- F. Paint materials and application: Section 09 91 00, PAINTING.
- G. 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):
 - AA-C22A41.....Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick
 - AA-C22A42.....Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick
 - AA-C22A44.....Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class I Architectural, 0.7-mil thick finish
- C. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):

- ANSI/SPRI ES-1-03.....Wind Design Standard for Edge Systems Used with
Low Slope Roofing Systems
- D. American Architectural Manufacturers Association (AAMA):
- AAMA 620.....Voluntary Specification for High Performance
Organic Coatings on Coil Coated Architectural
Aluminum
- AAMA 621.....Voluntary Specification for High Performance
Organic Coatings on Coil Coated Architectural
Hot Dipped Galvanized (HDG) and Zinc-Aluminum
Coated Steel Substrates
- E. ASTM International (ASTM):
- A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel
Steel Plate, Sheet, and Strip
- A653/A653M-09.....Steel Sheet Zinc-Coated (Galvanized) or Zinc
Alloy Coated (Galvanized) by the Hot- Dip
Process
- B32-08.....Solder Metal
- B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
- B370-09.....Copper Sheet and Strip for Building
Construction
- D173-03.....Bitumen-Saturated Cotton Fabrics Used in
Roofing and Waterproofing
- D412-06.....Vulcanized Rubber and Thermoplastic Elastomers-
Tension
- D1187-97(R2002).....Asphalt Base Emulsions for Use as Protective
Coatings for Metal
- D1784-08.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and
Chlorinated Poly (Vinyl Chloride) (CPVC)
Compounds
- D3656-07.....Insect Screening and Louver Cloth Woven from
Vinyl-Coated Glass Yarns
- D4586-07.....Asphalt Roof Cement, Asbestos Free
- F. Sheet Metal and Air Conditioning Contractors National Association
(SMACNA): Architectural Sheet Metal Manual.
- G. National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500-06.....Metal Finishes Manual
- H. Federal Specification (Fed. Spec):
- A-A-1925A.....Shield, Expansion; (Nail Anchors)

UU-B-790A.....Building Paper, Vegetable Fiber

I. International Code Commission (ICC): International Building Code,
Current Edition

1.4 PERFORMANCE REQUIREMENTS

A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:

1. Wind Zone 1: 0.48 to 0.96 kPa (10 to 20 lbf/sq. ft.): 1.92-kPa (40-lbf/sq. ft.) perimeter uplift force, 2.87-kPa (60-lbf/sq. ft.) corner uplift force, and 0.96-kPa (20-lbf/sq. ft.) outward force.
2. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 lbf/sq. ft.): 2.87-kPa (60-lbf/sq. ft.) perimeter uplift force, 4.31-kPa (90-lbf/sq. ft.) corner uplift force, and 1.44-kPa (30-lbf/sq. ft.) outward force.
3. Wind Zone 2: 1.48 to 2.15 kPa (31 to 45 lbf/sq. ft.): 4.31-kPa (90-lbf/sq. ft.) perimeter uplift force, 5.74-kPa (120-lbf/sq. ft.) corner uplift force, and 2.15-kPa (45-lbf/sq. ft.) outward force.
4. Wind Zone 3: 2.20 to 4.98 kPa (46 to 104 lbf/sq. ft.): 9.96-kPa (208-lbf/sq. ft.) perimeter uplift force, 14.94-kPa (312-lbf/sq. ft.) corner uplift force, and 4.98-kPa (104-lbf/sq. ft.) outward force.

B. Wind Design Standard: Fabricate and install copings tested per ANSI/SPRI ES-1 to resist design pressure.

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

C. Manufacturer's Literature and Data: For all specified items, including:

1. Two-piece counterflashing
2. Thru wall flashing
3. Expansion joint cover, each type
4. Nonreinforced, elastomeric sheeting

D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

PART 2 - PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS

A. Stainless Steel: ASTM A167, Type 302B, dead soft temper.

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

2.2 FLASHING ACCESSORIES

- A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.
- B. Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m² (6 lbs/100 sf).
- C. Bituminous Paint: ASTM D1187, Type I.
- D. Fasteners:
 - 1. Use copper, copper alloy, bronze, brass, or stainless steel for copper and copper clad stainless steel, and stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.
 - 2. Nails:
 - a. Minimum diameter for copper nails: 3 mm (0.109 inch).
 - b. Minimum diameter for aluminum nails 3 mm (0.105 inch).
 - c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
 - d. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.
 - 3. Rivets: Not less than 3 mm (1/8 inch) diameter.
 - 4. Expansion Shields: Fed Spec A-A-1925A.
- E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.
- F. Roof Cement: ASTM D4586.

2.3 SHEET METAL THICKNESS

- A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:
- B. Concealed Locations (Built into Construction):
 - 1. Stainless steel: 0.25 mm (0.010 inch) thick.
 - 2. Galvanized steel: 0.5 mm (0.021 inch) thick.
- C. Exposed Locations:
 - 1. Stainless steel: 0.4 mm (0.015 inch).
- D. Thickness of aluminum or galvanized steel is specified with each item.

2.4 FABRICATION, GENERAL

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

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

C. Cleats:

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

D. Edge Strips or Continuous Cleats:

1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.
2. Except as otherwise specified, fabricate edge strips or minimum 0.6 mm (0.024 inch) thick stainless steel.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using 1.6 mm (0.0625 inch) thick aluminum.

E. Drips:

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

F. Edges:

1. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
2. All metal roof edges shall meet requirements of IBC, current edition.

G. Metal Options:

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

2.5 FINISHES

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
- C. Finish exposed metal surfaces as follows, unless specified otherwise:
 1. Copper: Mill finish.
 2. Stainless Steel: Finish No. 2B or 2D.
 3. Aluminum:
 - a. Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1 Architectural, 18 mm (0.7 mils) thick.
 - b. Colored Finish: AA-C22A42 (anodized) or AA-C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1 Architectural, 18 mm (0.7 mils) thick. Dyes will not be accepted.
 - c. Fluorocarbon Finish: AAMA 620, high performance organic coating.
 - d. Mill finish.
 4. Steel and Galvanized Steel:
 - a. Finish painted under Section 09 91 00, PAINTING unless specified as prefinished item.

b. Manufacturer's finish:

- 1) Baked on prime coat over a phosphate coating.
- 2) Baked-on prime and finish coat over a phosphate coating.
- 3) Fluorocarbon Finish: AAMA 621, high performance organic coating.

2.6 THROUGH-WALL FLASHINGS

- A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.
1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
 2. Fabricate so keying nests at overlaps.
- B. Window Sill Flashing and Lintel Flashing:
1. Use either copper, stainless steel, copper clad stainless steel plane flat sheet, or nonreinforced elastomeric sheeting, bituminous coated copper, copper covered paper, or polyethylene coated copper.
 2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
 3. Turn up back edge as shown.
 4. Form exposed portion with drip as specified or receiver.
- C. Door Sill Flashing:
1. Where concealed, use either 0.5 Kg (20 oz) copper, 0.5 mm (0.018 inch) thick stainless steel, or 0.5 mm (0.018 inch) thick copper clad stainless steel.
 2. Where shown on drawings as combined counter flashing under threshold, sill plate, door sill, or where subject to foot traffic, use either 0.6 Kg (24 ounce) copper, 0.6 mm (0.024 inch) stainless steel, or 0.6 mm (0.024 inch) thick stainless steel.
 3. Fabricate flashing at ends to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening with folded corners.

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.
- B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).
- C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.
- D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.
- E. Pipe Flashing: (Other than engine exhaust or flue stack)
 1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
 2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
 3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
 - a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
 - b. Allow for loose fit around and into the pipe.
 4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
 - a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
 - b. Allow for loose fit around pipe.

2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)

- A. Either copper or stainless steel, unless specified otherwise.
- B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:
 1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
 2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
 3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
 4. Manufactured assemblies may be used.

5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.

C. One-piece Counterflashing:

1. Back edge turned up and fabricate to lock into reglet in concrete.
2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).

D. Two-Piece Counterflashing:

1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
2. Counterflashing upper edge designed to snap lock into receiver.

E. Surface Mounted Counterflashing; one or two piece:

1. Use at existing or new surfaces where flashing cannot be inserted in vertical surface.
2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.
3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.

F. Pipe Counterflashing:

1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
2. Fabricate 100 mm (4 inch) over lap at end.

3. Fabricate draw band of same metal as counter flashing. Use 0.6 Kg (24 oz) copper or 0.33 mm (0.013 inch) thick stainless steel or copper coated stainless steel.
 4. Use stainless steel bolt on draw band tightening assembly.
 5. Vent pipe counter flashing may be fabricated to omit draw band and turn down 25 mm (one inch) inside vent pipe.
- G. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

2.9 REGLETS

- A. Fabricate reglets of one of the following materials:
1. Stainless steel, not less than 0.3 mm (0.012 inch) thick.
 2. Plastic coated extruded aluminum, not less than 1.4 mm (0.055 inch) thick prefilled with butyl rubber sealer and complete with plastic wedges inserted at 1000 mm (40 inches) on centers.
 3. Plastic, ASTM D1784, Type II, not less than 2 mm (0.075 inch) thick.
- B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.
- C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the concrete.
- D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.
- E. Fabricate mitered corners, fittings, and special shapes as may be required by details.
- F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

2.10 INSULATED EXPANSION JOINT COVERS

- A. Either type optional, use only one type throughout.
- B. Types:
1. Construct of two preformed, stainless steel strips, not less than 0.4 mm (0.015 inch) thick, mechanically and adhesively bonded to both sides of a 2 mm (1/16 inch) thick neoprene or butyl sheet, or to a 0.4 mm (32 mil) thick reinforced chlorinated polyethylene sheet. Adhesively attach a 10 mm (3/8 inch) thick sheet of closed cell, neoprene foam insulation, to the underside of the neoprene, butyl, or chlorinated polyethylene sheet.

2. Constructed of a 2 mm (1/16 inch) thick vinyl sheet, flanged at both sides with stainless steel strips not less than 0.4 mm (0.015 inch) thick. Vinyl sheet locked and encased by the stainless steel strip and prepunched for nailing. A 10 mm (3/8 inch) thick closed cell polyvinyl chloride foam insulating strip shall be heat laminated to the underside of the vinyl sheet between the stainless steel strips.
- C. Expansion joint covers shall have factory fabricated mitered corners, crossing tees, and other necessary accessories. Furnish in the longest available lengths.
- D. Metal flange of sufficient width to extend over the top of the curb and down curb sides 50 mm (2 inches) with hemmed edge for lock to edge strip.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.

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

3.2 THROUGH-WALL FLASHING

A. General:

1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.
2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches) and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.
8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
11. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
14. Continue flashing around columns:
 - a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.

- b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).
- B. Flashing at Top of Concrete Foundation Walls Where concrete is exposed. Turn up not less than 200 mm (8 inch) high and into masonry backup mortar joint or reglet in concrete backup as specified.
- C. Flashing at Top of Concrete Floors (except where shelf angles occur): Place flashing in horizontal masonry joint not less than 200 mm (8 inch) below floor slab and extend into backup masonry joint at floor slab 38 mm (1 1/2 inch).
- D. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint.
- E. Flashing at Veneer Walls:
 - 1. Install near line of finish floors over shelf angles or where shown.
 - 2. Turn up against sheathing.
 - 3. At stud framing, hem top edge 19 mm (3/4 inch) and secure to each stud with stainless steel fasteners through sheathing.
 - 4. At concrete backing, extend flashing into reglet as specified.
 - 5. Coordinate with installation of waterproofing or asphalt felt for lap over top of flashing.
- F. Lintel Flashing when not part of shelf angle flashing:
 - 1. Install flashing full length of lintel to nearest vertical joint in masonry over veneer.
 - 2. Turn ends up 25 mm (one inch) and fold corners to form dam and extend end to face of wall.
 - 3. Turn back edge up to top of lintel; terminate back edge as specified for back-up wall.
- G. Window Sill Flashing:
 - 1. Install flashing to extend not less than 100 mm (4 inch) beyond ends of sill into vertical joint of masonry or veneer.
 - 2. Turn back edge up to terminate under window frame.
 - 3. Turn ends up 25 mm (one inch) and fold corners to form dam and extend to face of wall.

H. Door Sill Flashing:

1. Install flashing under bottom of plate sills of doors over curbs opening onto roofs. Extend flashing out to form counter flashing or receiver for counter flashing over base flashing. Set in sealant.
2. Extend sill flashing 200 mm (8 inch) beyond jamb opening. Turn ends up one inch in vertical masonry joint, extend end to face of wall. Join to counter flashing for water tight joint.
3. Where doors thresholds cover over waterproof membranes install sill flashing over water proof membrane under thresholds. Extend beyond opening to cover exposed portion of waterproof membrane and not less than 150 mm (6 inch) beyond door jamb opening at ends. Turn up approximately 6 mm (1/4 inch) under threshold.

I. Flashing at Masonry, Stone, or Precast Concrete Copings:

1. Install flashing with drips on both wall faces unless shown otherwise.
2. Form penetration openings to fit tight against dowel or other item with edge turned up. Seal penetrations with sealant.

3.3 BASE FLASHING

A. Install where roof membrane type base flashing is not used and where shown.

1. Install flashing at intersections of roofs with vertical surfaces or at penetrations through roofs, to provide watertight construction.
2. Install metal flashings and accessories having flanges extending out on top of the built-up roofing before final bituminous coat and roof aggregate is applied.
3. Set flanges in heavy trowel coat of roof cement and nail through flanges into wood nailers over bituminous roofing.
4. Secure flange by nailing through roofing into wood blocking with nails spaced 75 mm (3 inch) on centers or, when flange over 100 mm (4 inch) wide terminate in a 13 mm (1/2 inch) folded edge anchored with cleats spaced 200 mm (8 inch) on center. Secure one end of cleat over nail heads. Lock other end into the seam.

B. For long runs of base flashings install in lengths of not less than 2400 mm (8 feet) nor more than 3000 mm (ten feet). Install a 75 mm (3 inch) wide slip type, loose lock expansion joint filled with sealant in joints of base flashing sections over 2400 mm (8 feet) in length. Lock and solder corner joints at corners.

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

3.4 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. General:

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

B. One Piece Counterflashing:

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

C. Two-Piece Counterflashing:

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

3.5 REGLETS

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

3.6 COPINGS

- A. General:
 1. On walls topped with a wood plank, install a continuous edge strip on the front and rear edge of the plank. Lock the coping to the edge strip with a 19 mm (3/4 inch) loose lock seam.
 2. Where shown turn down roof side of coping and extend down over base flashing as specified for counter-flashing. Secure counter-flashing to lock strip in coping at continuous cleat.
 3. Install ends adjoining existing construction so as to form space for installation of sealants. Sealant is specified in Section 07 92 00, JOINT SEALANTS.
- B. Aluminum Coping:
 1. Install with 6 mm (1/4 inch) joint between ends of coping sections.
 2. Install joint covers, centered at each joint, and securely lock in place.

3.7 EXPANSION JOINT COVERS, INSULATED

- A. Install insulated expansion joint covers at locations shown on curbs not less than 200 mm (8 inch) high above roof surface.
- B. Install continuous edge strips of same metal as expansion joint flange, nailed at not less than 75 mm (3 inch) centers.
- C. Install insulated expansion joint covers in accordance with manufacturer's directions locking edges to edge strips.

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SECTION 07 72 00
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies copings, gravel stops, fascias, and expansion joints.

1.2 RELATED WORK

- A. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES
- B. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.
- C. General insulation: Section 07 21 13, THERMAL INSULATION
- D. 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 (four by four inches), except extrusions shall be a width not less than section to be used. Sample shall show coating with integral color and texture and shall include manufacturer's identifying label.
- C. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- D. Manufacturer's Literature and Data: Each item specified.
- E. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Material (ASTM):
B209/209M-07.....Aluminum and Aluminum Alloy-Sheet and Plate

B221/221M-08.....Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes

C612-10.....Mineral Fiber Block and Board Thermal
Insulation

D1187-97 (R2002).....Asphalt-Base Emulsions for Use as Protective
Coatings for Metal

C. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual

D. American Architectural Manufacturers Association (AAMA):
2605-11.....High Performance Organic Coatings on
Architectural Extrusions and Panels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum, Extruded: ASTM B221/B221M.
- B. Aluminum Sheet: ASTM B209/B209M.
- C. Galvanized Sheet Steel: ASTM A526/A526M; G-90 coating.
- D. Insulation: ASTM C612, Class 1 or 2.
- E. Asphalt Coating: ASTM D 1187, Type I, quick setting.

2.2 COPINGS

- A. Fabricate of aluminum not less than 2 mm (0.08 inch) thick
- B. Turn outer edges down each face of wall as shown.
- C. Maximum lengths of 3000 mm (10 feet).
- D. Shop fabricate external and internal corners as one piece assemblies with not less than 300 mm (12 inch) leg lengths.
- E. Provide 100 mm (four inch) wide 0.8 mm (0.032 inch) thick watertight joint covers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install roof accessories where shown.
- B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.
- C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.

E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.

F. Aluminum Coping:

1. Install sections of coping with approximately 6 mm (1/4-inch) space between ends of sections.
2. Center joint gutter bar and covers at joints and securely lock in place.
3. When snap-on system is used insure front and back edges are locked in place.

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

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

3.4 PROTECTION

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

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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. Expansion and seismic joint firestopping: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
- C. Sealants and application: Section 07 92 00, JOINT SEALANTS.
- D. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS and 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. 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.

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):
 - E84-10.....Surface Burning Characteristics of Building Materials
 - E814-11.....Fire Tests of Through-Penetration Fire Stops

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

- A. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 100 mm (4 in) nominal pipe or 0.01 m² (16 sq. in.) in overall cross sectional area.
- C. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.
- D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
 - 1. Contain no flammable or toxic solvents.
 - 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.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide EZ-PATH Fire Rated Pathway, by Specified Technologies Inc., or a comparable product by another manufacturer.

<http://www.stifirestop.com/ezpath/>

- 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 ASTM E814.
- H. Materials to be asbestos free.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS

- A. Use silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Use mineral fiber filler and bond breaker behind sealant.
- C. Sealants shall have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with E84.
- D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION

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 (six 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 Resident Engineer.
- C. Clean up spills of liquid type materials.

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SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION:

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. Firestopping penetrations: Section 07 84 00, FIRESTOPPING.
- B. Glazing: Section 08 80 00, GLAZING.
- C. Sound rated gypsum partitions/sound sealants: Section 09 29 00, GYPSUM BOARD.
- D. Mechanical Work: Section 21 05 11, COMMON WORK RESULTS FOR FIRE PROTECTION Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

1.3 QUALITY CONTROL:

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 - 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
 - 4. Test other joint sealants for compliance with requirements indicated 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 Resident Engineer seven days in advance of dates and times when test joints will be erected.
- E. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.
- F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this section.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.
- D. Manufacturer's Literature and Data:
1. Caulking compound
 2. Primers
 3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- E. LEED Submittals:
1. Provide date for Credit IEQ 4.1: For adhesives and sealants used inside of weatherproofing system, including printed statement of VOC content.

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 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):

- C509-06.....Elastomeric Cellular Preformed Gasket and
Sealing Material.
- C612-10.....Mineral Fiber Block and Board Thermal
Insulation.
- C717-10.....Standard Terminology of Building Seals and
Sealants.
- C834-10.....Latex Sealants.
- C919-08.....Use of Sealants in Acoustical Applications.
- C920-10.....Elastomeric Joint Sealants.
- C1021-08.....Laboratories Engaged in Testing of Building
Sealants.
- C1193-09.....Standard Guide for Use of Joint Sealants.
- C1330-02 (R2007).....Cylindrical Sealant Backing for Use with Cold
Liquid Applied Sealants.
- D1056-07.....Specification for Flexible Cellular Materials—
Sponge or Expanded Rubber.
- E84-09.....Surface Burning Characteristics of Building
Materials.

C. Sealant, Waterproofing and Restoration Institute (SWRI).
The Professionals' Guide

PART 2 - PRODUCTS

2.1 LEED:

- A. All products used inside the building envelope shall meet the
requirements for low emitting materials. See Section 01 81 13.16
SUSTAINABLE DESIGN REQUIREMENTS FOR COMMERCIAL INTERIORS.

2.2 SEALANTS:

- A. S-1:
 - 1. ASTM C920, polyurethane or polysulfide.
 - 2. Type M.
 - 3. Class 25.
 - 4. Grade NS.
 - 5. Shore A hardness of 20-40
- B. S-2:
 - 1. ASTM C920, polyurethane or polysulfide.
 - 2. Type M.
 - 3. Class 25.

4. Grade P.
 5. Shore A hardness of 25-40.
- C. S-3:
1. ASTM C920, polyurethane or polysulfide.
 2. Type S.
 3. Class 25, joint movement range of plus or minus 50 percent.
 4. Grade NS.
 5. Shore A hardness of 15-25.
 6. Minimum elongation of 700 percent.
- D. S-4:
1. ASTM C920 polyurethane or polysulfide.
 2. Type S.
 3. Class 25.
 4. Grade NS.
 5. Shore A hardness of 25-40.
- E. S-5:
1. ASTM C920, polyurethane or polysulfide.
 2. Type S.
 3. Class 25.
 4. Grade P.
 5. Shore hardness of 15-45.
- F. S-6:
1. ASTM C920, silicone, neutral cure.
 2. Type S.
 3. Class: Joint movement range of plus 100 percent to minus 50 percent.
 4. Grade NS.
 5. Shore A hardness of 15-20.
 6. Minimum elongation of 1200 percent.
- G. S-7:
1. ASTM C920, silicone, neutral cure.
 2. Type S.
 3. Class 25.
 4. Grade NS.
 5. Shore A hardness of 25-30.
 6. Structural glazing application.
- H. S-8:
1. ASTM C920, silicone, acetoxo cure.
 2. Type S.

3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Structural glazing application.

I. 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.

J. S-10:

1. ASTM C920, coal tar extended fuel resistance polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 15-20.

K. S-11:

1. ASTM C920 polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 35 to 50.

L. S-12:

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.

2.3 CAULKING COMPOUND:

- A. C-1: ASTM C834, acrylic latex.
- B. C-2: One component acoustical caulking, non drying, non hardening, synthetic rubber.

2.4 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.
- D. Caulking shall be light gray or white, unless specified otherwise.

2.5 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.

2.6 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.

2.7 PRIMER:

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

2.8 CLEANERS-NON POUROUS SURFACES:

Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION:

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

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. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
 1. Apply primer prior to installation of back-up rod or bond breaker tape.
 2. Use brush or other approved means that will reach all parts of joints.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

3.3 BACKING INSTALLATION:

- A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.
- 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° C and 38° C (40° and 100° F).
 2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
 3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.

4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
 5. Avoid dropping or smearing compound on adjacent surfaces.
 6. Fill joints solidly with compound and finish compound smooth.
 7. Tool joints to concave surface unless shown or specified otherwise.
 8. Finish paving or floor joints flush unless joint is otherwise detailed.
 9. Apply compounds with nozzle size to fit joint width.
 10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.
- B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.
- C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.
1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with 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. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

3.7 CLEANING:

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

- A. Exterior Building Joints, Horizontal and Vertical:
 - 1. Metal to Metal: Type S-1, S-2
 - 2. Metal to Masonry or Stone: Type S-1
 - 3. Masonry to Masonry or Stone: Type S-1
 - 4. Stone to Stone: Type S-1
 - 5. Cast Stone to Cast Stone: Type S-1
 - 6. Threshold Setting Bed: Type S-1, S-3, S-4
 - 7. Masonry Expansion and Control Joints: Type S-6
 - 8. Wood to Masonry: Type S-1
- B. Metal Reglets and Flashings:
 - 1. Flashings to Wall: Type S-6
 - 2. Metal to Metal: Type S-6
- C. Sanitary Joints:
 - 1. Walls to Plumbing Fixtures: Type S-9
 - 2. Counter Tops to Walls: Type S-9
 - 3. Pipe Penetrations: Type S-9
- D. Horizontal Traffic Joints:
 - 1. Concrete Paving, Unit Pavers: Type S-11 or S-12
 - 2. Garage/Parking Decks: Type S-10
- 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. Joints at Masonry Walls and Columns, Piers, Concrete Walls or Exterior Walls: Types C-1 and C-2.

4. Perimeter of Lead Faced Control Windows and Plaster or Gypsum
Wallboard Walls: Types C-1 and C-2.
5. Exposed Isolation Joints at Top of Full Height Walls: Types C-1 and
C-2.
6. Exposed Acoustical Joint at Sound Rated Partitions Type C-2.
7. Concealed Acoustic Sealant Types S-4, C-1 and C-2.

- - - E N D - - -

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. Frames fabricated of structural steel: Section 05 50 00, METAL FABRICATIONS.
- B. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- C. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- D. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.

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. Submit proof of temperature rating.
 - 2. Sound rated doors, including test report from Testing Laboratory.

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.):
 - L-S-125B.....Screening, Insect, Nonmetallic
- C. Door and Hardware Institute (DHI):
 - A115 Series.....Steel Door and Frame Preparation for Hardware,
Series A115.1 through A115.17 (Dates Vary)
- D. Steel Door Institute (SDI):
 - 113-01 (R2006).....Thermal Transmittance of Steel Door and Frame
Assemblies
 - 128-09.....Acoustical Performance for Steel Door and Frame
Assemblies
- E. American National Standard Institute:
 - A250.8-2003 (R2008).....Specifications for Standard Steel Doors and
Frames
- F. American Society for Testing and Materials (ASTM):
 - A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel
Steel Plate, Sheet, and Strip
 - A568/568-M-11.....Steel, Sheet, Carbon, and High-Strength, Low-
alloy, Hot-Rolled and Cold-Rolled
 - A1008-10.....Steel, sheet, Cold-Rolled, Carbon, Structural,
High Strength Low Alloy and High Strength Low
Alloy with Improved Formability
 - B209/209M-10.....Aluminum and Aluminum-Alloy Sheet and Plate
 - B221/221M-12.....Aluminum and Aluminum-Alloy Extruded Bars,
Rods, Wire, Profiles and Tubes
 - D1621-10.....Compressive Properties of Rigid Cellular
Plastics
 - D3656-07.....Insect Screening and Louver Cloth Woven from
Vinyl Coated Glass Yarns
 - E90-09.....Laboratory Measurement of Airborne Sound
Transmission Loss of Building Partitions
- G. The National Association Architectural Metal Manufacturers (NAAMM):
 - Metal Finishes Manual (AMP 500-06)
- H. National Fire Protection Association (NFPA):
 - 80-13.....Fire Doors and Fire Windows
- I. Underwriters Laboratories, Inc. (UL):
 - Fire Resistance Directory
- J. Intertek Testing Services (ITS):
 - Certifications Listings...Latest Edition

K. Factory Mutual System (FM):
Approval Guide

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A167, Type 302 or 304; finish, NAAMM Number 4.
- B. Sheet Steel: ASTM A1008, cold-rolled for panels (face sheets) of doors.
- C. Anchors, Fastenings and Accessories: Fastenings anchors, clips connecting members and sleeves from zinc coated steel.
- D. Insect Screening: ASTM D3656, 18 by 18 regular mesh.
- E. Aluminum Sheet: ASTM B209/209M.
- F. Aluminum, Extruded: ASTM B221/221M.
- G. Prime Paint: Paint that meets or exceeds the requirements of A250.8.

2.2 FABRICATION GENERAL

- A. GENERAL:
 - 1. Follow ANSI 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 ANSI 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. Standard Duty Doors: ANSI A250.8, Level 1, Full flush seamless design of size and design shown. Use for interior locations only. Do not use for stairwell doors, security doors and detention doors.
- C. Heavy Duty Doors: ANSI A250.8, Level 2, Full flush seamless design 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.
- D. Smoke Doors:
 - 1. Close top and vertical edges flush.
 - 2. Provide seamless vertical edges.
 - 3. Apply Steel astragal to the meeting style at the active leaf of pair of doors or double egress doors.
 - 4. Provide clearance at head, jamb and sill as specified in NFPA 80.

E. 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.

F. 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. ANSI 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 markings.

4. Frames for doors specified to have automatic door operators; service window: minimum 1.7 mm (0.067 inch) thick.

5. Knocked-down frames are **not** acceptable.

B. Reinforcement and Covers:

1. ANSI 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.

C. Terminated Stops: ANSI A250.8.

D. Glazed Openings and Panel Opening:

a. Integral stop on exterior, corridor, or secure side of door.

b. Design rabbet width and depth to receive glazing material or panel shown or specified.

E. 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 by (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.
- 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.

2.4 TRANSOM PANELS

- A. Fabricate panels as specified for flush doors.

2.5 LOUVERS

A. General:

- 1. Sight proof type with stationary blades the full thickness of the door.
- 2. Design lightproof louvers to exclude passage of light but permit free ventilation.
- 3. Provide insect screen and wire guards at exterior doors, except where doors are located below completely enclosed areaways, the wire guard is not required.

B. Fabrication:

- 1. Steel louvers 0.8 mm (0.032 inch) thick for interior doors, and 1.3 mm (0.053 inch) inch thick for exterior doors.
- 2. Fabricate louvers as complete units. Install in prepared cutouts in doors.

3. Weld stationary blades to frames. Weld louvers into door openings.

C. Screen frames:

1. Frame of either extruded aluminum or tubular aluminum.
2. Fabricate frame to hold wire fabric in a channel with a retaining bar anchor and to mount on surface of door with screws.
3. Do not lap frame over louver opening.
4. Miter corners of frame members and join by concealed mechanical fastenings extending about 57 mm (2-1/4 inches) into ends of each member.
5. Drill frame and doors for screw attachment. Space screws 50 mm (2 inches) from end of each leg of frame and not over 300 mm (12 inches) on center between end screws.
6. Finish: Clear anodized finish, 0.4 mils thick.
7. Insect Screens: Fasten insect screens to interior side of doors with retaining bar against door and not exposed to view.
8. Wire Guards:
 - a. Wire fabric shall be wire guard screen as specified.
 - b. Fasten wire guard to exterior side of door with retaining bar against door and not exposed to view.

2.6 SHOP PAINTING

ANSI A250.8.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Plumb, align and brace frames securely until permanent anchors are set.
1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
 2. Use wood spreaders at bottom of frame if the shipping spreader is removed.
 3. Protect frame from accidental abuse.
 4. Where construction will permit concealment, leave the shipping spreaders in place after installation, otherwise remove the spreaders after the frames are set and anchored.
 5. Remove wood spreaders and braces only after the walls are built and jamb anchors are secured.

B. Floor Anchors:

1. Anchor the bottom of door frames to floor with two 6 mm (1/4 inch) diameter expansion bolts. Use 9 mm (3/8 inch) bolts on lead lined frames.
2. Power actuated drive pins may be used to secure frame anchors to concrete floors.

C. Jamb Anchors:

1. Anchors in masonry walls: Embed anchors in mortar. Fill space between frame and masonry wall with grout or mortar as walls are built.
2. Coat frame back with a bituminous coating prior to lining of grout filling in masonry walls.
3. Secure anchors to sides of studs with two fasteners through anchor tabs. Use steel drill screws to steel studs.
4. Frames set in prepared openings of masonry or concrete: Expansion bolt to wall with 6 mm (1/4 inch) expansion bolts through spacers. Where subframes or rough bucks are used, 6 mm (1/4 inch) expansion bolts on 600 mm (24 inch) centers or power activated drive pins 600 mm (24 inches) on centers. Secure two piece frames to subframe or rough buck with machine screws on both faces.

D. Install anchors for labeled fire rated doors to provide rating as required.

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

3.2 INSTALLATION OF DOORS AND APPLICATION OF HARDWARE

Install doors and hardware as specified in Section 08 11 13, HOLLOW METAL DOORS AND FRAMES; Section 08 14 00, INTERIOR WOOD DOORS; Section 08 71 00, DOOR HARDWARE.

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SECTION 08 14 00
INTERIOR WOOD DOORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies interior flush doors and stile and rail doors with prefinish, prefit option.
- B. Section includes fire rated doors, sound retardant doors, and smoke doors.

1.2 RELATED WORK

- A. Metal door frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- B. Door hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- C. Installation of doors and hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 14 00, WOOD DOORS, or Section 08 71 00, DOOR HARDWARE.
- D. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- E. Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Metal louvers: Section 08 90 00, LOUVERS AND VENTS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. Corner section of flush veneered door 300 mm (12 inches) square, showing details of construction, labeled to show grade and type number and conformance to specified standard.
 - 2. Veneer sample 200 mm (8 inch) by 275 mm (11 inch) by 6 mm (1/4 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is accepted.
- C. Shop Drawings:
 - 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.
 - 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.

F. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that wood products specified to be made from certified wood comply with forest certification requirements. Include evidence that door manufacturer is certified for chain of custody by an FSC accredited certification body. Include statement indicating costs for each certified wood product.
2. Product data for Credit IEQ 4.4: For adhesive and composite wood materials, documentation indicating urea formaldehyde content.

1.4 QUALITY ASSURANCE

- A. Forest Certification: Provide doors made from wood products obtained from forests certified by an FSC-accredited certification body to comply with STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.5 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.

1.6 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, 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):

I.S.1A-11.....Architectural Wood Flush Doors

I.S.4-09.....Water-Repellent Preservative Non-Pressure
Treatment for Millwork

I.S.6A-11.....Architectural Wood Stile and Rail Doors

T.M.6-08.....Adhesive (Glue Bond) Durability Test Method

T.M.7-08.....Cycle-Slam Test Method

T.M.8-08.....Hinge Loading Test Method

T.M.10-08.....Screwholding Test Method

C. National Fire Protection Association (NFPA):

80-10.....Protection of Buildings from Exterior Fire

252-08.....Fire Tests of Door Assemblies

D. ASTM International (ASTM):

E90-09.....Laboratory Measurements of Airborne Sound
Transmission Loss

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION - GENERAL

A. Adhesives shall not contain urea formaldehyde

B. Particleboard-Core Doors:

1. ANSI A208.1, made with binder containing no urea formaldehyde resin

2.2 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.

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, clear cut, white maple, plain sliced.

a. A grade face veneer standard optional.

b. AA grade face veneer

c. Match face veneers for doors for uniform effect of color and grain at joints.

d. Door edges shall be same species as door face veneer.

- e. 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. Factory finish all doors.
- 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.
 - 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. Stiles and Rails:
 - 1. Option for wood stiles and rails:
 - a. Composite material having screw withdrawal force greater than minimum performance level value when tested in accordance with WDMA T.M.10.
 - 2. Provide adequate blocking for bottom of doors having mechanically operated door bottom seal meeting or exceeding the performance duty level per T.M.10 for horizontal door edge screw holding.
 - 3. Rabbeted transom meeting rail edges match face veneers of doors. Bottom rail of transom panel match face veneer on non rabbeted meeting rail edge.
- E. Fire rated wood doors:
 - 1. Fire Performance Rating:
 - a. "B" label, 1-1/2 hours.
 - b. "C" label, 3/4 hour.
 - 2. Labels:
 - a. Doors shall conform to the requirements of ASTM E2074, or NFPA 252, and, carry an identifying label from a qualified testing and

- inspection agency for class of door or opening shown designating fire performance rating.
- b. Metal labels with raised or incised markings.
- 3. Performance Criteria for Stiles of doors utilizing standard mortise leaf hinges:
 - a. Hinge Loading: WDMA T.M.8. Average of 10 test samples for Extra Heavy Duty doors.
 - b. Direct screw withdrawal: WDMA T.M.10 for Extra Heavy Duty doors. Average of 10 test samples using a steel, fully threaded #12 wood screw.
 - c. Cycle Slam: 1,000,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with WDMA T.M.7.
- 4. Additional Hardware Reinforcement:
 - a. Provide fire rated doors with hardware reinforcement blocking.
 - b. Size of lock blocks as required to secure hardware specified.
 - c. Top, bottom and intermediate rail blocks shall measure not less than 125 mm (five inches) minimum by full core width.
 - d. Reinforcement blocking in compliance with manufacturer's labeling requirements.
 - 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.
- F. 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.
- G. Sound Rated Doors:
 - 1. Fabricated as specified for flush wood doors with additional construction requirements to meet specified sound transmission class (STC).
 - 2. 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.

2.3 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) shall be factory finished as follows:
 1. WDMA I.S.1-A Section F-3 specification for System TR-4, Conversion Varnish or System TR-5, Catalyzed Vinyl.
 2. Use stain when required to produce the finish specified in Section 09 06 00 SCHEDULE FOR FINISHES.

2.4 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.

2.5 SEALING:

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 (two inches) of door thickness.

F. Immediately after fitting and cutting of doors for hardware, seal cut edges of doors with two coats of water resistant sealer.

G. Finish surfaces, including both faces, top and bottom and edges of the doors smooth to touch.

H. Apply a steel astragal on the opposite side of active door on pairs of fire rated doors.

I. Apply a steel astragal to meeting 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

B. Provide protective covering over knobs and handles in addition to covering door.

C. Maintain covering in good condition until removal is approved by Resident Engineer.

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SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Section specifies access doors or panels.

1.2 RELATED WORK

- A. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.
- B. 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):
 - A167-99(R-2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - A1008-10.....Steel Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy
- C. American Welding Society (AWS):
 - D1.3-08.....Structural Welding Code Sheet Steel
- D. National Fire Protection Association (NFPA):
 - 80-10.....Fire Doors and Windows
- E. The National Association of Architectural Metal Manufacturers (NAAMM):
 - AMP 500 Series.....Metal Finishes Manual
- F. Underwriters Laboratories, Inc. (UL):
 - 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.
- 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.

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.

2.4 ACCESS DOOR, RECESSED PANEL

A. Door Panel:

1. Form of 1.2 mm (0.0478 inch) thick steel sheet to form a 25 mm (one inch) deep recessed pan to accommodate the installation of acoustical units or other materials where shown in walls and ceiling.
2. Reinforce as required to prevent sagging.

B. Frame:

1. Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit installation in suspension system of ceiling or wall framing.
2. Extend sides of frame to protect edge of acoustical units when panel is in open position.
3. Provide shims, bushings, clips and other devices necessary for installation.

C. Hinge: Continuous steel hinge with stainless steel pin or concealed hinge.

D. Lock:

1. Flush screwdriver operated cam lock.
2. Provide sleeve of plastic or stainless steel grommet to protect hole made in acoustical unit for screwdriver access to lock.

2.5 FINISH

- A. Provide in accordance with NAAMM AMP 500 series on exposed surfaces.
- B. Steel Surfaces: Stainless Steel Type 304 No. 4 Satin Finish Brushed.
- C. Stainless Steel: No. 4 for exposed surfaces.

2.6 LOCKS

Provide cylinder locks, keyed alike with two (2) keys per lock.

2.7 SIZE

Minimum 600 mm (24 inches) square door unless otherwise shown.

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.

3.2 INSTALLATION, GENERAL

- A. Install access doors in openings to have sides vertical in wall installations, and parallel to ceiling suspension grid or side walls when installed in ceiling.
- B. Set frames so that edge of frames without flanges will finish flush with surrounding finish surfaces.
- C. Set frames with flanges to overlap opening and so that face will be uniformly spaced from the finish surface.
- D. Set recessed panel access doors recessed so that face of surrounding materials will finish on the same plane, when finish in door is installed.

3.3 ANCHORAGE

- A. Secure frames to adjacent construction using anchors attached to frames or by use of bolts or screws through the frame members.
- B. Type, size and number of anchoring device suitable for the material surrounding the opening, maintain alignment, and resist displacement during normal use of access door.
- C. Anchors for fire rated access doors shall meet requirements of applicable fire test.

3.4 ADJUSTMENT

- A. Adjust hardware so that door panel will open freely.
- B. Adjust door when closed so door panel is centered in the frame.

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**SECTION 08 33 13
COILING COUNTER DOORS**

PART 1 -GENERAL

1.1 DESCRIPTION

- A. This section specifies coiling door and grills of sizes shown, complete as specified.

1.2 RELATED WORK

- A. Lock cylinder and keying: Section 08 71 00, DOOR HARDWARE.
- 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:
 - Shutter, each type.
 - Installation procedures and instructions.
- C. Shop Drawings:
 - Shutter, each type, showing details of construction and installation.

1.4 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):
 - A47-99(R2009).....Malleable Iron Castings
 - A48-03(R2008).....Gray Iron Castings
 - A53-10.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated
Welded and Seamless
 - A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel
Steel Plate, Sheet and Strip
 - A653-10.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-
Iron Alloy Coated (Galvannealed) by the Hot Dip
Process
 - B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
 - B221-08.....Aluminum and Aluminum-Alloy Extruded Bars,
Rods, Wire, Shapes, and Tubes
 - F468-10.....Nonferrous Bolts, Hex Cap Screws, and Studs for
General Use
 - F593-02(R2008).....Stainless Steel Bolts, Hex Cap Screws, and
Studs

- C. American Welding Society (AWS):
 - D1.1-10.....Structural Welding Code Steel
 - D1.2-08.....Structural Welding Code Aluminum
 - D1.3-08.....Structural Welding Code Sheet Steel
- D. National Association of Architectural Metal Manufacturers (NAAMM)
 - AMP 500 Series-2006.....Metal Finishes Manual
- E. American Architectural Manufacturers Association (AAMA):
 - 2605-11.....Voluntary Specification for High Performance
Organic Coatings on Architectural Extrusions
and Panels
- F. Federal Specifications (Fed. Spec):
 - TT-P-645B.....Primer, Paint, Zinc-Molybdates, Alkyd Type
- G. National Fire Protection Association (NFPA):
 - 80-10.....Fire Doors and Fire Windows

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: A653 for forming operations. ASTM A36 for structural sections
- B. Aluminum:
 - 1. Extruded: ASTM B221, alloy 6063-T5.
 - 2. Sheet: ASTM B209.
- C. Stainless Steel: ASTM A167, Type 302 or 304.
- D. Primer: Fed. Spec. TT-P-645.

2.2 FABRICATION

- A. Weld in accordance with AWS applicable code.
- B. Fire Rated Shutter:
 - 1. Integral counter, shutter, and frame type unit for installation with hood and fascia, sloping top, related accessories and components, and automation closing by fusible link.
 - 2. Comply with NFPA 80. The counter shall have Underwriters Laboratories Inc., or other nationally recognized laboratory label for Class B opening as shown.
 - 3. Construct for recessed installation.
 - 4. Construct of galvanized steel stainless steel on exposed to view components except counter.
 - 5. Counter: Minimum 2 mm (0.0747-inch) thick stainless steel with flush closed soffits and ends.

6. Curtain:
 - a. Flat type slats, approximately 32 mm (1 1/4-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 counter. Lock cylinder specified in Section 08 71 00, DOOR HARDWARE.
7. Hood and Fascia: Steel Sheet, formed with beads or flanges to prevent deflection.
8. Frame: Frame jamb sections to include guide slots for curtain with receiver for bolts and locks and continuous closure angles.
9. Counterbalance Assembly:
 - a. Spring barrel or shaft of steel pipe of sufficient strength to ensure deflection not exceeding 1 mm (0.03-inch) per 300 mm (1 foot) of span.
 - b. Barrel or shaft house oil-tempered, helically wound steel spring, and rotate on grease-sealed ball or roller-bearing units.
 - c. Spring adjustable from outside.
 - d. Brackets not less than 3 mm (0.125-inch) thick steel designed to form end closure support for head.
10. Operation:
 - a. Manual Push-up type for curtains less than 2130 mm (7-feet) wide. Crank operated for curtains over 2130 mm (7-feet) wide with automatic release when activated by fusible link.
 - b. Equip shutter with an automatic closing device actuated by fusible link to release at 130 degrees F. located exposed below the ceiling on both sides of opening in accordance with NFPA No. 80.

2.3 FINISH

- A. Aluminum:
 1. Finish in accordance with NAAMM AMP 500 and 501 or 504.
 2. Chemically etched medium matte, with clear anodic coating, AA-C-22A41. Class II Architectural, 0.06 mm (0.4 mils) thick (AMP 501). Class II Architectural, 0.06 mm (0.4 mils) thick. (AMP 501).
- B. Stainless Steel: Mechanical finish No. 4 in accordance with NAAMM AMP 500 and AMP 503.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturer's instructions.
- B. Locate anchors and inserts for guides, brackets, supports, hardware, and other accessories and components accurately.
- C. 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.

3.2 REPAIR

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

3.3 PROTECTION

- A. Isolate aluminum in contact with or fastened to dissimilar metal other than stainless steel, white bronze or other metals compatible with aluminum by painting the dissimilar or aluminum with a coat of TT-P-645 primer, or by placing an approved caulking compound, or a non-absorptive tape, or gasket between the aluminum and dissimilar metal.
- B. Paint aluminum in contact with masonry or concrete with a coat of TT-P-645.

3.4 ADJUSTING AND CLEANING

- A. Lubricate properly, adjust and demonstrate, to operate freely and as specified.
- B. Clean upon completion.

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SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies aluminum entrance work including, interior ICU doors, and other components to make a complete assembly.

1.2 RELATED WORK:

- A. Glass and Glazing: Section 08 80 00, GLAZING.
- B. Hardware: Section 08 71 00, DOOR HARDWARE.
- D. 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, anchorage, reinforcement, and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Doors, each type.
 - 2. Entrance and Storefront construction.
- D. Samples:
 - 1. Samples for initial selection: for units with factory applied color finishes- including samples of hardware and accessories involving color selection.
 - 2. Two samples of anodized aluminum of each color showing finish and maximum shade range.
 - 3. Samples for verification: for aluminum framed storefront system and components.
- E. LEED Submittals
 - 1. Provide data for Credit IEQ 4.1: for adhesives and sealants used inside of weatherproofing system, including printed statement of VOC content.

1.4 QUALITY ASSURANCE:

- A. Approval by Contracting Officer 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'.
- C. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 10 years of documented experience in manufacturing of doors and

equipment of similar to that indicated for this Project and that have a proven record of successful in-service performance.

- D. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 5 years documented experience installing and maintenance of units similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- E. Certified Inspector Qualifications: Certified by AAADM.
- F. Source Limitations for intensive care unit/critical care unit (ICU/CCU) entrances: Obtain each type of door, frame, and operator specified in this Section from a single source, same manufacturer unless otherwise indicated.
- G. Certifications: Operators shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards.
 - 1. ANSI/BHMA A156.19 Standards for Power Assist and Low Energy Power Operated Doors

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimension of aluminum framed storefront openings by field measurement before fabrication and indicate field measurements on Shop Drawings.

1.6 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.

1.7 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):
 - B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
 - B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

- E283-04.....Rate of Air Leakage Through Exterior Windows,
Curtain Walls, and Doors Under Specified
Pressure Differences Across the Specimen
- E331-00(R2009).....Water Penetration of Exterior Windows, Curtain
Walls, and Doors by Uniform Static Air Pressure
Difference
- F468-10.....Nonferrous Bolts, Hex Cap Screws, and Studs for
General Use
- F593-02(R2008).....Stainless Steel Bolts, Hex Cap Screws, and
Studs
- C. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500 Series.....Metal Finishes Manual
- D. American Architectural Manufacturer's Association (AAMA):
2604-10.....High Performance Organic Coatings on
Architectural Aluminum Extrusions and Panels
- E. American Welding Society (AWS):
D1.2-08.....Structural Welding Code Aluminum

1.8 PERFORMANCE REQUIREMENTS:

- A. General: Provide doors that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Intensive care unit/critical care unit (ICU/CCU) door equipment accommodates up to 280 pounds (127 kg) weight of doors.
- C. Opening Force requirements: Doors shall open with a manual force, not to exceed 30lbf (133N) to set the door in motion and 15 lbf to fully open the door applied at 1" (25 mm) from the latch edge of the door. The force required to prevent a stopped door from opening or closing shall not exceed 15 lbf (67 N) measured 1" (25 mm) from the latch edge of the door at any point during opening or closing.
- D. Closing Time:
 - 1. Doors shall be field adjustable to close from 90 degrees to 10 degrees in 3 seconds or longer as applicable per ANSI/BHMA A156.19 standards.
 - 2. Doors shall be field adjusted to close from 10 degrees to fully closed in not less than 1.5 seconds.
- E. Antimicrobial silver-based ion finish on all exposed surfaces including door pulls, door extrusions, rails and header to comply with the manufacturer's specified requirements.]

1. Antimicrobial finish must permanently suppress the growth of bacteria, algae, fungus, mold and mildew.

PART 2 - PRODUCTS

2.1 INTENSIVE CARE UNIT (ICU) ENTRANCES DOOR PACKAGES:

- A. Door configuration: Manually operated swing doors, configuration and size as indicated on the drawings.
 1. Uneven Pair of Swing Doors: Two active leaves (both primary panels).
 2. Mounting: Overhead header installed between jambs.
- B. Dimensions: Confirm door package dimensions as indicated on Architectural drawings.

2.2 ALUMINUM DOORS AND FRAMES

- A. Doors and Frames: Extruded Aluminum, Alloy 6063-T5 or 6063-T6.
 1. Door panels shall have a minimum .125" (3.2 mm) structural wall thickness including adjoining horizontal members and perimeter frames where applicable.
 - a. Aluminum extrusions shall allow for a factory installed, slide-in type, replaceable gasket.
 - b. Self-adhesive type seals are not allowed on door stiles.
 2. Door Construction shall be by means of an integrated corner block with 3/8 inch diameter all thread through bolt from each stile.
 3. Glass Stops shall be .062" wall thickness and shall provide security function as a standard by means of a fixed non-removable exterior section with glazing to be performed from the interior only. Glazing stops that allow for glass removal from the exterior shall not be deemed as equivalent.
 4. [Bottom rails shall be provided with a concealed adjustable sweep.]
 5. Vertical Stiles shall be medium stile 4 inch (102 mm).
 6. Bottom Rails shall be 10 inch (254 mm).
- B. Glass: Glazing shall comply with ANSI Z97.1, thickness as indicated.
 1. Door Panel Glazing: 1-1/4" (31 mm) tempered, unless otherwise specified.
 2. Glazing Installation: Dry glazing; wet glazing not allowed.
 - a. See Division 8 Section Glazing for requirements.
 3. Integral Blinds: Glass to have blinds installed between glass panes
- C. Framing Members: Provide ICU/CCU entrances as complete assemblies. Manufacturer's standard extruded aluminum framing shall have a minimum

.109" (2.8 mm) structural wall thickness and shall be reinforced as required to support loads.

1. Vertical Jambs shall be 1-3/4 inches (44 mm) by 4-1/2 inches (114 mm).

D. Header: Extruded aluminum header shall have a minimum .109" (2.8 mm) structural wall thickness and shall extend the full width of entrance unit.

1. Low profile header: 4-1/2 inches (114 mm) wide by 1-3/4 inches (44.5 mm) high.

E. Hardware: Provide manufacturer's standard hardware as required for operation indicated.

1. Hinges: Full-mortise, gear type, continuous hinge.

2. Door Pulls: Manufacturer's surface-mounted, C-shaped, door pull installed on both sides of active door leave(s).

3. Latching hardware shall be provided as indicated.

a. Latching Hardware (active door leaves): Roller latch mounted in the top door rail.

b. Manual operated flush bolt to secure inactive door leaf.

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 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.

2.5 COLUMN COVERS AND TRIM

A. Fabricate column covers and trim shown from 1.5 mm (0.0625 inch) thick sheet aluminum of longest available lengths.

B. Use concealed fasteners.

- C. Provide aluminum stiffener and other supporting members shown or as required to maintain the integrity of the components.

2.6 FINISH

- A. [MicroShield™ antimicrobial silver-based ion, baked-on enamel finish on all exposed surfaces including door pulls, door extrusions, rails and header.]
 - 1. Antimicrobial finish must permanently suppress the growth of bacteria, algae, fungus, mold and mildew by the controlled release of silver ions that attack microbes and inhibit the growth on the treated surfaces.
 - 2. Coating to be EPA registered resulting in a safe and non-toxic finish; chlorinated or synthetic chemical finishes will not be accepted.

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 (eight 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.
- D. Install hardware specified under Section 08 71 00, DOOR HARDWARE.

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:

- B. 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.

- - - E N D - - -

SECTION 08 56 19
PASS WINDOWS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies sliding glass counter mounted pass windows.

1.2 RELATED WORK

- A. Color of factory finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Pass window opening: Section 08 33 13, COILING COUNTER DOORS.
- C. Glass and Glazing: Section 08 80 00, GLAZING.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extend referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - B221/221M-08.....Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Shapes and Tubes (Metric)
 - C509-06.....Elastomeric Cellular Preformed Gasket and Sealing Material
- C. American Society of Mechanical Engineers (ASME):
 - B18.6.4-98(R2005).....Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws
- D. Master Painters Institute (MPI):
 - MPI #18.....Organic Zinc Rich Coating
- E. National Association of Architectural Metal Manufacturers (NAAMM):
 - AMP 500 Series.....Metal Finishes Manual
 - AMP 500.....Introduction to Metal Finishing
 - AMP 501.....Finishes for Aluminum

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Aluminum Extrusions:
 - 1. ASTM B 221 M.
 - 2. Alloy and temper recommended by window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 150 MPa (22,000 psi) ultimate tensile strength, and yield of 110 MPa (16,000 psi).
 - 3. Aluminum alloy used for colored anodic coating as required to produce specified color.

- B. Paint: MPI #18.
- C. Glazing Gaskets: ASTM C 509.

2.1 SLIDING GLASS PASS WINDOWS, COUNTER MOUNTED

- A. Fabricate sliding glass sash and frames of extruded aluminum with corners mitered.
- B. Fabricate sash to receive 6 mm (1/4 inch) thick glass.
- C. Fabricate sliding sash of "H" channel molding at bottom edges including concealed nylon rollers at bottom set on track and guides at top set into track.
- D. Provide sash with pin tumbler lock and two keys.
- E. Provide sash with finger slot on vertical edge.
- F. Fabricate frame with channel sash slot, bottom roller track, and top guides.
- G. Sash may be factory or field glazed using glazing gaskets.
- H. Use concealed screws in assembly.
- I. Finish:
 - 1. Comply with NAAMM AMP 500 Series.
 - 2. Clear anodic coating, Class II Architectural 0.4 mills thick, AA-C22A41.
 - 3. Colored anodic coating, Class II, Architectural, 0.4 mills thick, AA-C22A42.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in pass window opening level and plumb.
- B. Secure with screws to opening; ASME B18.6.4.
 - 1. Screw within 100 mm (4 inches) of ends.
 - 2. Space screws not over 600 mm (24 inches) between end screws.
- C. Coat aluminum in contact with steel with one coat of MPI No. 18.
- D. Clean unit of dust and markings.

3.2 OPERATION

- A. Adjust to roll smoothly and stay in position where stopped.
- B. Demonstrate to Resident Engineer operation and locking.
- C. Turn keys with key tags over to Resident Engineers.

- - E N D - - -

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 11 13, HOLLOW METAL DOORS AND FRAMES Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS Section 08 33 13, COILING COUNTER DOORS
- C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Painting: Section 09 91 00, PAINTING.
- E. Card Readers: Section 28 13 50, BASIC DOOR ACCESS CONTROL REQUIREMENTS.
- 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 made to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.
- E. The following items shall be of the same manufacturer, except as otherwise specified:
 - 1. Mortise locksets.
 - 2. Hinges for hollow metal and wood doors.
 - 3. Surface applied overhead door closers.
 - 4. Exit devices.

5. Floor closers.

1.4 WARRANTY

A. Automatic door operators shall be subject to the terms of FAR Clause 52.246-21, except that the Warranty period shall be two years in lieu of one year for all items except as noted below:

1. Locks, latchsets, and panic hardware: 5 years.
2. Door closers and continuous hinges: 10 years.

1.5 MAINTENANCE MANUALS

A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS", furnish maintenance manuals and instructions on all door hardware. Provide installation instructions with the submittal documentation.

1.6 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23. Submit 2 final copies of the final approved schedules to VAMC Locksmith as record copies (VISN Locksmith if the VAMC does not have a locksmith).

B. Hardware Schedule: Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr. Name and Catalog No.	Key Control Symbols	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designation

C. Samples and Manufacturers' Literature:

1. Samples: All hardware items (proposed for the project) that have not been previously approved by Builders Hardware Manufacturers Association shall be submitted for approval. Tag and mark all items with manufacturer's name, catalog number and project number.
2. Samples are not required for hardware listed in the specifications by manufacturer's catalog number, if the contractor proposes to use the manufacturer's product specified.

- D. Certificate of Compliance and Test Reports: Submit certificates that hardware conforms to the requirements specified herein. Certificates shall be accompanied by copies of reports as referenced. The testing shall have been conducted either in the manufacturer's plant and certified by an independent testing laboratory or conducted in an independent laboratory, within four years of submittal of reports for approval.

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 Resident Engineer for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in Resident Engineer's office until all other similar items have been installed in project, at which time the Resident Engineer will deliver items on file to Contractor for installation in predetermined locations on the project.

1.8 PREINSTALLATION MEETING

- A. Convene a pre-installation 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.

1.9 INSTRUCTIONS

- A. Hardware Set Symbols on Drawings: Except for protective plates, door stops, mutes, thresholds and the like specified herein, hardware requirements for each door are indicated on drawings by symbols.

Symbols for hardware sets consist of letters (e.g., "HW") followed by a number. Each number designates a set of hardware items applicable to a door type.

- B. Keying: All cylinders shall be keyed into existing Great Grand Master Key System. Provide removable core cylinders that are removable only with a special key or tool without disassembly of knob or lockset. Cylinders shall be 7 pin type. Keying information shall be furnished at a later date by the Resident Engineer.

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):
- F883-04.....Padlocks
 - 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):
- A156.1-06.....Butts and Hinges
 - A156.2-03.....Bored and Pre-assembled Locks and Latches
 - A156.3-08.....Exit Devices, Coordinators, and Auto Flush
Bolts
 - A156.4-08.....Door Controls (Closers)
 - A156.5-01.....Auxiliary Locks and Associated Products
 - A156.6-05.....Architectural Door Trim
 - A156.8-05.....Door Controls-Overhead Stops and Holders
 - A156.12-05Interconnected Locks and Latches
 - A156.13-05.....Mortise Locks and Latches Series 1000
 - A156.14-07Sliding and Folding Door Hardware
 - A156.15-06.....Release Devices-Closer Holder, Electromagnetic
and Electromechanical
 - A156.16-08.....Auxiliary Hardware
 - A156.17-04Self-Closing Hinges and Pivots
 - A156.18-06.....Materials and Finishes
 - A156.20-06Strap and Tee Hinges, and Hasps

A156.21-09.....Thresholds
A156.22-05.....Door Gasketing and Edge Seal Systems
A156.23-04.....Electromagnetic Locks
A156.24-03.....Delayed Egress Locking Systems
A156.25-07Electrified Locking Devices
A156.26-06.....Continuous Hinges
A156.28-07Master Keying Systems
A156.29-07Exit Locks and Alarms
A156.30-03High Security Cylinders
A156.31-07Electric Strikes and Frame Mounted Actuators
A250.8-03.....Standard Steel Doors and Frames

D. National Fire Protection Association (NFPA):

80-10.....Fire Doors and Fire Windows
101-09.....Life Safety Code

E. Underwriters Laboratories, Inc. (UL):

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: 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 6.35mm (0.25-inch) minimum diameter pin that extends entire length of hinge.
1. Base Metal for Exterior Hinges: Stainless steel.
 2. Base Metal for Interior Hinges: Stainless steel
 3. Base Metal for Hinges for Fire-Rated Assemblies: Stainless steel
 4. Provide with non-removable pin (hospital tip option) at lockable outswing doors.
 5. Where required to clear adjacent casing, trim, and wall conditions and allow full door swing, provide wide throw hinges of minimum width required.
 6. Provide with manufacturer's cut-outs for separate mortised power transfers and/or mortised automatic door bottoms where they occur.
 7. Where thru-wire power transfers are integral to the hinge, provide hinge with easily removable portion to allow easy access to wiring connections.
 8. Where models are specified that provide an integral wrap-around edge guard for the hinge edge of the door, provide manufacturer's

adjustable threaded stud and machine screw mechanism to allow the door to be adjusted within the wrap-around edge guard.

2.3 DOOR CLOSING DEVICES

- A. Closing devices shall be products of one manufacturer for each type specified.

2.4 OVERHEAD CLOSERS

- A. Conform to ANSI A156.4, Grade 1.
- B. Closers shall conform to the following:
 - 1. The closer shall have minimum 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back check effective between 60 degrees and 85 degrees of door opening.
 - 2. Where specified, closer shall have hold-open feature.
 - 3. Size Requirements: Provide multi-size closers, sizes 1 through 6, except where multi-size closer is not available for the required application.
 - 4. Material of closer body shall be forged or cast.
 - 5. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.
 - 6. Where closers are exposed to the exterior or are mounted in rooms that experience high humidity, provide closer body and arm assembly of stainless steel material.
 - 7. Closers shall have full size metal cover; plastic covers will not be accepted.
 - 8. Closers shall have adjustable hydraulic back-check, separate valves for closing and latching speed, adjustable back-check positioning valve, and adjustable delayed action valve.
 - 9. Provide closers with any accessories required for the mounting application, including (but not limited to) drop plates, special soffit plates, spacers for heavy-duty parallel arm fifth screws, bull-nose or other regular arm brackets, longer or shorter arm assemblies, and special factory templating. Provide special arms, drop plates, and templating as needed to allow mounting at doors with overhead stops and/or holders.
 - 10. Closer arms or backcheck valve shall not be used to stop the door from overswing, except in applications where a separate wall, floor, or overhead stop cannot be used.
 - 11. Provide parallel arm closers with heavy duty rigid arm.

12. Where closers are to be installed on the push side of the door, provide parallel arm type except where conditions require use of top jamb arm.
13. Provide all surface closers with the same body attachment screw pattern for ease of replacement and maintenance.
14. All closers shall have a 1 ½" (38mm) minimum piston diameter.

2.5 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.
- 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).

2.6 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.

2.7 FLOOR DOOR HOLDERS

- A. Conform to ANSI Standard A156.16. Provide extension strikes for Types L01301 and L01311 holders where necessary.

2.8 LOCKS AND LATCHES

- A. Conform to ANSI A156.2. Locks and latches for doors 45 mm (1-3/4 inch) thick or over shall have beveled fronts. Lock cylinders shall have not less than seven pins. Cylinders for all locksets shall be removable core type. Cylinders shall be furnished with construction removable cores and construction master keys. Cylinder shall be removable by special key or tool. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the Great Grand Master Key System. Disassembly of lever or lockset shall not be required to remove core from lockset. All locksets or latches on double doors with fire label shall have latch bolt with 19 mm (3/4 inch) throw, unless shorter throw allowed by the door manufacturer's fire label. Provide temporary keying device or construction core of allow opening and closing during construction and prior to the installation of final cores.
- B. In addition to above requirements, locks and latches shall comply with following requirements:
 - 1. Mortise Lock and Latch Sets: Conform to ANSI/BHMA A156.13. Mortise locksets shall be series 1000, minimum Grade 2. All locksets and latchsets, except on designated doors in Psychiatric (Mental Health) areas, shall have lever handles fabricated from cast stainless

- steel. Provide sectional (lever x rose) lever design matching Falcon T-Series "Dane". No substitute lever material shall be accepted. All locks and latchsets shall be furnished with 122.55 mm (4-7/8-inch) curved lip strike and wrought box. At outswing pairs with overlapping astragals, provide flat lip strip with 21mm (7/8-inch) lip-to-center dimension. Lock function F02 shall be furnished with emergency tools/keys for emergency entrance. Furnish armored fronts for all mortise locks. Where mortise locks are installed in high-humidity locations or where exposed to the exterior on both sides of the opening, provide non-ferrous mortise lock case.
2. Cylindrical Lock and Latch Sets: levers shall meet ADA (Americans with Disabilities Act) requirements. Cylindrical locksets shall be series 4000 Grade I. 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. Provide lever design to match design selected by Architect or to match existing lever design. Where two turn pieces are specified for lock F76, turn piece on inside knob shall lock and unlock inside knob, and turn piece on outside knob shall unlock outside knob when inside knob is in the locked position. (This function is intended to allow emergency entry into these rooms without an emergency key or any special tool.)
 3. Auxiliary locks shall be as specified under hardware sets and conform to ANSI A156.5.
 4. Privacy locks in non-mental-health 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).

2.9 PUSH-BUTTON COMBINATION LOCKS

- A. ANSI/BHMA A156.13, Grade 1. Battery operated pushbutton entry.
- B. Construction: Heavy duty mortise lock housing conforming to ANSI/BHMA A156.13, Grade 1. Lever handles and operating components in compliance with the 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.

2.10 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: 500 lbf (2224 N).
3. Inductive Kickback Peak Voltage: Not more than 530 V.
4. Residual Magnetism: Not more than 0 lbf (0 N) to separate door from magnet.

- B. Delayed-Egress Locks: BHMA A156.24. Listed under Category G in BHMA's "Certified Product Directory".

1. Means of Egress Doors: Lock releases within 15 seconds after applying a force not more than 15 lbf (67 N) for not more than 3 seconds, as required by NFPA 101.
2. Security Grade: Activated from secure side of door by initiating device.
3. Movement Grade: Activated by door movement as initiating device.
4. The lock housing shall not project more than 4-inches (101mm) from the underside of the frame head stop.

2.11 ELECTRIC STRIKES

- A. ANSI/ BHMA A156.31 Grade 1.
- B. General: Use fail-secure electric strikes at fire-rated doors.

2.12 KEYS

- A. Stamp all keys with change number and key set symbol. Furnish keys in quantities as follows:

Locks/Keys	Quantity
Cylinder locks	2 keys each
Cylinder lock change key blanks	100 each different key way
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys

Control key	2 keys
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2.13 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 Resident Engineer.

2.14 ARMOR PLATES, KICK PLATES, MOP PLATES AND DOOR EDGING

- A. Conform to ANSI Standard A156.6.
- B. Provide protective plates and door edging as specified below:
 - 1. Kick plates, mop plates and armor plates of metal, Type J100 series.
 - 2. Provide kick plates and mop plates where specified. Kick plates shall be 254 mm (10 inches) or 305 mm (12 inches) high. Mop plates

- shall be 152 mm (6 inches) high. Both kick and mop plates shall be minimum 1.27 mm (0.050 inches) thick. Provide kick and mop plates beveled on all 4 edges (B4E). On push side of doors where jamb stop extends to floor, make kick plates 38 mm (1-1/2 inches) less than width of door, except pairs of metal doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other kick and mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick and mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.
3. Kick plates and/or mop plates are not required on following door sides:
 - a. Armor plate side of doors;
 - b. Exterior side of exterior doors;
 - c. Closet side of closet doors;
 - d. Both sides of aluminum entrance doors.
 4. Armor plates for doors are listed under Article "Hardware Sets". Armor plates shall be thickness as noted in the hardware set, 875 mm (35 inches) high and 38 mm (1-1/2 inches) less than width of doors, except on pairs of metal doors. Provide armor plates beveled on all 4 edges (B4E). Plates on pairs of metal doors shall be 25 mm (1 inch) less than width of each door. Where top of intermediate rail of door is less than 875 mm (35 inches) from door bottom, extend armor plates to within 13 mm (1/2 inch) of top of intermediate rail. On doors equipped with panic devices, extend armor plates to within 13 mm (1/2 inch) of panic bolt push bar.
 5. Where louver or grille occurs in lower portion of doors, substitute stretcher plate and kick plate in place of armor plate. Size of stretcher plate and kick plate shall be 254 mm (10 inches) high.
 6. Provide stainless steel edge guards where so specified at wood doors. Provide mortised type instead of surface type except where door construction and/or ratings will not allow. Provide edge guards of bevel and thickness to match wood door. Provide edge guards with factory cut-outs for door hardware that must be installed through or extend through the edge guard. Provide full-height edge guards except where door rating does not allow; in such cases, provide edge guards to height of bottom of typical lockset armor front. Forward edge guards to wood door manufacturer for factory installation on doors.

2.15 EXIT DEVICES

- A. Conform to ANSI Standard A156.3. Exit devices shall be Grade 1; type and function are specified in hardware sets. Provide flush with finished floor strikes for vertical rod exit devices in interior of building. Trim shall have cast satin stainless steel lever handles of design similar to locksets, unless otherwise specified. Provide key cylinders for keyed operating trim and, where specified, cylinder dogging.
- B. Surface vertical rod panics shall only be provided less bottom rod; provide fire pins as required by exit device and door fire labels. Do not provide surface vertical rod panics at exterior doors.
- C. Concealed vertical rod panics shall be provided less bottom rod at interior doors, unless lockable or otherwise specified; provide fire pins as required by exit device and door fire labels. Where concealed vertical rod panics are specified at exterior doors, provide with both top and bottom rods.
- D. Where removable mullions are specified at pairs with rim panic devices, provide mullion with key-removable feature.
- E. At non-rated openings with panic hardware, provide panic hardware with key cylinder dogging feature.
- F. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

2.16 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).

2.17 FLUSH BOLTS (AUTOMATIC)

- A. Conform to ANSI A156.3. Dimension of flush bolts shall conform to ANSI A115. Bolts shall conform to Underwriters Laboratories, Inc.,

requirements for fire door hardware. Flush bolts shall automatically latch and unlatch. Furnish dustproof strikes conforming to ANSI A156.16 for bottom flushbolt. Face plates for dustproof strike shall be rectangular and not less than 38 mm by 90 mm (1-1/2 by 3-1/2 inches).

- B. At interior doors, provide auto flush bolts less bottom bolt, unless otherwise specified, except at wood pairs with fire-rating greater than 20 minutes; provide fire pins as required by auto flush bolt and door fire labels.

2.18 DOOR PULLS WITH PLATES

- A. Conform to ANSI A156.6. Pull Type J401, 152 mm (6 inches) high by 19 mm (3/4 inches) diameter with plate Type J302, 90 mm by 350 mm (3-1/2 inches by 14 inches), unless otherwise specified. Provide pull with projection of 70 mm (2 3/4 inches) and a clearance of 51 mm (2 inches). Cut plates of door pull plate for cylinders, or turn pieces where required.

2.19 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 J302 plates 100 mm (4 inches wide by 350 mm (14 inches) high) where push plates are specified for doors with stiles less than 200 mm (8 inches) wide. Cut plates for cylinders, and turn pieces where required.

2.20 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.

2.21 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.

2.22 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 ¼-20 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.

2.23 RESERVED

2.24 WEATHERSTRIPS (FOR EXTERIOR DOORS)

- A. Conform to ANSI A156.22. Air leakage shall not to exceed 0.50 CFM per foot of crack length ($0.000774\text{m}^3/\text{s/m}$).

2.25 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. 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.

2.26 RESERVED

2.27 THERMOSTATIC TEMPERATURE CONTROL VALVE CABINETS VERIRY IN PROJECT

- 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.

2.28 RESERVED

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. Hardware Finishes for Existing Buildings: U.S. Standard finishes shall match finishes of hardware in (similar) existing spaces except where otherwise specified.

- E. Special Finish: Exposed surfaces of hardware for dark bronze anodized aluminum doors shall have oxidized oil rubbed bronze finish (dark bronze) finish on door closers shall closely match doors.
- F. Anti-microbial Coating: All hand-operated hardware (levers, pulls, push bars, push plates, paddles, and panic bars) shall be provided with an anti-microbial/anti-fungal coating that has passed ASTM E2180 tests. Coating to consist of ionic silver (Ag⁺). Silver ions surround bacterial cells, inhibiting growth of bacteria, mold, and mildew by blockading food and respiration supplies.

2.30 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 Verify Heights with current ADA standards

- A. For existing buildings locate hardware on doors at heights to match existing hardware. The Contractor shall visit the site, verify location of existing hardware and submit locations to VA Resident Engineer for approval.
- B. 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. At exterior doors, closers shall be mounted on interior side. Where closers are mounted on doors they shall be mounted with sex nuts and bolts; foot shall be fastened to frame with machine screws.

B. Hinge Size Requirements:

Door Thickness	Door Width	Hinge Height
45 mm (1-3/4 inch)	900 mm (3 feet) and less	113 mm (4-1/2 inches)
45 mm (1-3/4 inch)	Over 900 mm (3 feet) but not more than 1200 mm (4 feet)	125 mm (5 inches)
35 mm (1-3/8 inch) (hollow core wood 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 Resident Engineer. 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 Resident Engineer 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 Resident Engineer for his records.) Installation of locks which do not meet specified keying requirements shall be considered sufficient justification for rejection and replacement of all locks installed on project.

3.3 FINAL INSPECTION

- A. Installer to provide letter to VA Resident/Project Engineer that upon completion, installer has visited the Project and has accomplished the following:
 - 1. Re-adjust hardware.
 - 2. Evaluate maintenance procedures and recommend changes or additions, and instruct VA personnel.
 - 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.

3.5 HARDWARE SETS

- A. Following sets of hardware correspond to hardware symbols shown on drawings. Only those hardware sets that are shown on drawings will be required. Disregard hardware sets listed in specifications but not shown on drawings.
- B. Hardware Consultant working on a project will be responsible for providing additional information regarding these hardware sets. The numbers shown in the following sets come from BHMA standards.

ELECTRIC HARDWARE ABBREVIATIONS LEGEND:

ADO = Automatic Door Operator

EMCH = Electro-Mechanical Closer-Holder

MHO = Magnetic Hold-Open (wall- or floor-mounted)

INTERIOR SINGLE DOORS

HW-1

Each Door to Have:

NON-RATED

1	Continuous Hinge	
1	Door Pull w/ Plate	J401 x J302
1	Push Plate	J302
1	Kick Plate	J102
1	Mop Plate (@ Inswing Doors)	J103
1	Closer	C02011/C02021
1	Floor Stop	L02121 x 3 FASTENERS
3	Silencers	L03011

HW-2

Each Door to Have:

RATED/NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Keyed Privacy Indicator Lock	F13 x OCCUPANCY INDICATOR
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154
STONE THRESHOLD BY OTHER TRADES.	

HW-3E

Each Door to Have:

NON-RATED

	Hinges	QUANTITY & TYPE AS REQUIRED
1	Office Lock	F04
1	Floor Stop	L02121 x 3 FASTENERS
1	Set Self-Adhesive Seals	R0Y154
1	Coat Hook	L03121

OMIT COAT HOOK WHERE GLASS LITE PREVENTS INSTALLATION.

HW-3G

Each Door to Have:

NON-RATED

	Hinges	QUANTITY & TYPE AS REQUIRED
1	Office Lock	F04
1	Floor Stop	L02121 x 3 FASTENERS
1	Coat Hook	L03121
1	Door Viewer (Mental Health Only)	L03221 - 190° (VIEW INTO CORRIDOR)
1	Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1	Auto Door Bottom	R0Y346 - HEAVY DUTY
2	Sets Self-Adhesive Seals	R0Y154

OMIT VIEWER IF DOOR PROVIDED WITH VISION LITE.

OMIT COAT HOOK WHERE GLASS LITE PREVENTS INSTALLATION.

HW-4E

Each Door to Have:

NON-RATED/RATED

	Hinges	QUANTITY & TYPE AS REQUIRED
1	Utility Lock	F09
1	Closer (@ rated doors)	C02011/C02021
1	Closer (@ non-rated doors)	C02051/C02061
1	Kick Plate	J102
1	Floor Stop	L02121 x 3 FASTENERS
1	Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1	Auto Door Bottom	R0Y346 - HEAVY DUTY
2	Sets Self-Adhesive Seals	R0Y154

HW-4F

Each Door to Have:

RATED

1	Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1	Utility Lock	F09
1	Closer	C02011/C02021
1	Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1	Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1	Floor Stop (@ Outswing Doors)	L02121 x 3 FASTENERS
1	Wall Stop (@ Inswing Doors)	L02101 CONVEX
1	Set Self-Adhesive Seals	R0Y154

HW-4G

Each Door to Have:

RATED/NON-RATED

	Hinges	QUANTITY & TYPE AS REQUIRED
1	Utility Lock	F09
1	Closer (@ Rated Doors)	C02011/C02021
1	Kick Plate	J102
1	Floor Stop	L02121 x 3 FASTENERS
1	Set Self-Adhesive Seals	R0Y154

HW-4K

Each Door to Have:

NON-RATED

1	Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1	Utility Lock	F09
1	Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1	Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1	Floor Stop	L02121 x 3 FASTENERS
1	Set Self-Adhesive Seals	R0Y154

HW-5

Each Door to Have:

RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Closer	C02011/C02021
1 Kick Plate	J102 (@ STORAGE, EVM, & HAC ROOMS ONLY)
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-5B

Each Door to Have:

RATED

1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Storeroom Lock	F07
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

INTERIOR PAIRS OF DOORS

HW-8B

Each Pair to Have:

NON-RATED

2 Continuous Hinge	
2 Push Plate	J304 8" x 16"
2 Hospital Grip	J401
2 Kick Plate	J102
2 Mop Plate (@ Inswing Doors)	J103
2 Closer	C02011/C02021
2 Floor Stop	L02121 x 3 FASTENERS
2 Silencers	L03011

HW-10B

Each Pair to Have:

NON-RATED/RATED

2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Hospital Lock	F08 x PADDLES POINTING DOWN
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
1 Closers (@ rated doors)	C02011/C02021
2 Heavy-Duty Armor Plates	J101 x 3.175 MM (0.125 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS

INSTALL LOCK TRIM PROTECTOR BAR ON PUSH SIDE OF ACTIVE LEAF TO PROTECT
LEVER TRIM.

HW-11

Each Pair to Have:

RATED/NR

Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Storeroom Lock	F07
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Closers	C02011/C02021
2 Kick Plates	J102 (@ STORAGE ROOMS ONLY)
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

INTERIOR SINGLE SECURITY DOORS

HW-SH-3C

Each [PB] Door to Have:

NON-RATED/RATED

1	Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1	Push-button Combination Lock	N3 - A156.13 F07 G1 E06
1	Closer	C02011/C02021
1	Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1	Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1	Floor Stop	L02121 x 3 FASTENERS
1	Set Self-Adhesive Seals	R0Y154

HW-SH-9A

Each [PB] Pair to Have:

RATED

2	Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1	Set Auto Flush Bolts	TYPE 25
1	Dust Proof Strike	L04021
1	Push-button Combination Lock	N3 - A156.13 F07 G1 E06
1	Coordinator	TYPE 21A
1	Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2	Closers	C02011/C02021
2	Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2	Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2	Floor Stops	L02121 x 3 FASTENERS
1	Set Self-Adhesive Seals	R0Y154

- - - 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. Glazing products specified apply to factory or field glazed items.

1.2 RELATED WORK

- A. Factory glazed by manufacturer in following units:
1. HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, INTERIOR WOOD DOORS.
 2. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
 3. Section 08 44 43, GLAZED ALUMINUM CURTAIN WALLS.
 4. Color of spandrel glass, tinted (heat absorbing or light reducing) glass, and reflective (metallic coated) glass: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 LABELS

- A. Temporary labels:
1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness.
 2. Label in accordance with NFRC (National Fenestration Rating Council) label requirements.
 3. Temporary labels shall remain intact until glass is approved by Resident Engineer.
- 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.
 - c. Organic coated glass.

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 verify applicable code.
2. Test in accordance with ASTM E 1300.
3. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

1.5 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Certificates:

1. Certificates stating that wire glass, meets requirements for safety glazing material as specified in ANSI Z97.1.
2. Certificate on shading coefficient.
3. Certificate on "R" value when value is specified.

C. Warranty: 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. Transparent (one-way vision glass) mirrors.
4. Elastic compound for metal sash glazing.
5. Glazing cushion.
6. Sealing compound.

E. Samples:

1. Size: 150 mm by 150 mm (6 inches by 6 inches).
2. Tinted glass.
3. Reflective glass.
4. Transparent (one-way vision glass) mirrors.
5. Spandrel Glass

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.

G. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.
- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.
- D. Protect laminated security glazing units against face and edge damage during entire sequence of fabrication, handling, and delivery to installation location. Provide protective covering on exposed faces of glazing plastics, and mark inside as "INTERIOR FACE" or "PROTECTED FACE":
 1. Treat security glazing as fragile merchandise, and packaged and shipped in export wood cases with width end in upright position and blocked together in a mass. Storage and handling shall comply with Manufacturer's directions and as required to prevent edge damage or other damage to glazing resulting from effects of moisture, condensation, temperature changes, direct exposure to sun, other environmental conditions, and contact with chemical solvents.
 2. Protect sealed-air-space insulating glazing units from exposure to abnormal pressure changes, as could result from substantial changes in altitude during delivery by air freight. Provide temporary breather tubes which do not nullify applicable warranties on hermetic seals.
 3. Temporary protections: The glass front and polycarbonate back of glazing shall be temporarily protected with compatible, peelable, heat-resistant film which will be peeled for inspections and re-applied and finally removed after doors and windows are installed at destination. Since many adhesives will attack polycarbonate, the film used on exposed polycarbonate surfaces shall be approved and applied by manufacturer.

4. Edge protection: To cushion and protect glass clad, polycarbonate, and Noviflex edges from contamination or foreign matter, the four edges shall be sealed the depth of glazing with continuous standard-thickness Santoprene tape. Alternatively, continuous channel shaped extrusion of Santoprene shall be used, with flanges extending into face sides of glazing.
5. Protect "Constant Temperature" units including every unit where glass sheet is directly laminated to or directly sealed with metal-tube type spacer bar to polycarbonate sheet, from exposures to ambient temperatures outside the range of 16 to 24 C, during the fabricating, handling, shipping, storing, installation, and subsequent protection of glazing.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Field measure openings before ordering tempered glass products. 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.
 3. Polycarbonate to remain clear and ultraviolet light stabilized for 5 years.
 4. Insulating plastic to not have more than 6 percent decrease in light transmission and be ultraviolet light stabilized for 10 years.

1.9 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American National Standards Institute (ANSI):
Z97.1-09.....Safety Glazing Material Used in Building -
Safety Performance Specifications and Methods
of Test.
- C. American Society for Testing and Materials (ASTM):
C542-05.....Lock-Strip Gaskets
C716-06.....Installing Lock-Strip Gaskets and Infill
Glazing Materials.
C794-10.....Adhesion-in-Peel of Elastomeric Joint Sealants

- C864-05.....Dense Elastomeric Compression Seal Gaskets,
Setting Blocks, and Spacers
- C920-11.....Elastomeric Joint Sealants
- C964-07.....Standard Guide for Lock-Strip Gasket Glazing
- C1036-06.....Flat Glass
- C1048-12.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated
and Uncoated Glass.
- C1172-09.....Laminated Architectural Flat Glass.
- C1363-05.....Thermal Performance of Building Assemblies,
by Means of A Hot Box Apparatus
- C1376-10.....Pyrolytic and Vacuum Deposition Coatings on
Flat Glass
- D635-10.....Rate of Burning and/or Extent and Time of
Burning of Self-Supporting Plastic in a
Horizontal Position
- D4802-10.....Poly (Methyl Methacrylate) Acrylic Plastic
Sheet
- E84-10.....Surface Burning Characteristics of Building
Materials
- E119-10.....Standard Test Methods for Fire Test of Building
Construction and Material
- E2190-10.....Insulating Glass Unit
- D. Commercial Item Description (CID):
- A-A-59502.....Plastic Sheet, Polycarbonate
- E. Code of Federal Regulations (CFR):
- 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; 2010
- F. National Fire Protection Association (NFPA):
- 80-13.....Fire Doors and Windows.
- 252-12.....Standard Method of Fire Test of Door Assemblies
- G. National Fenestration Rating Council (NFRC)
- H. Safety Glazing Certification Council (SGCC) 2012:
Certified Products Directory (Issued Semi-Annually).
- I. Underwriters Laboratories, Inc. (UL):
- 752-11.....Bullet-Resisting Equipment.
- J. Unified Facilities Criteria (UFC):
- 4-010-01-2012.....DOD Minimum Antiterrorism Standards for
Buildings
- K. Glass Association of North America (GANA):

Glazing Manual (Latest Edition)

Sealant Manual (2009)

L. American Society of Civil Engineers (ASCE):

ASCE 7-10.....Wind Load Provisions

M. CPSC 16CFR-1201 - Safety Standard for Architectural Glazing Materials.

1.10 DEFINITIONS

A. Sealed Insulating Glass Unit Surfaces:

1. Surface No. 1: Exterior surface of outer lite.
2. Surface No. 2: Interior surface of outer lite.
3. Surface No. 3: Exterior surface of inner lite.
4. Surface No. 4: Interior surface of inner lite.

B. Airspace: Space between lites of an insulating glass unit that contains dehydrated air or other inert specified gas.

1.11 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Minimum of 5 years experience manufacturing solar control coated glass.

B. Fabricator's Qualifications:

1. Minimum of 5 years experience manufacturing sealed insulating glass units meeting ASTM E 2190, Class CBA.
2. Certified by manufacturer.

C. Mock-Ups:

1. Comply with Section 01450 - Quality Control.
2. Obtain acceptance of mock-ups by Architect before proceeding with work.

D. Substitutions: No substitution will be considered unless the architect has received a request for approval in writing.

PART 2 - PRODUCT

2.1 HEAT-TREATED GLASS

A. Clear Tempered Glass:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

2.2 COATED GLASS

A. Spandrel Glass:

1. ASTM C1048, Kind HS, Condition B, Type I.
2. Thickness, 6 mm (1/4 inch).

2.3 ETCHED GLASS

A. Clear Etched Glass: Type G8

1. Basis of Design Product: Skyline Design: Organics
No: S0#110708-001 Custom Asian Grass
2. 1/4" thick tempered glass minimum
3. Custom size: As indicated on drawings

B. Clear Etched Glass: Type G9

1. Basis of Design Product: Skyline Design: Organics
No: S0#110708-003 Custom Asian Grass
2. 1/4" thick tempered glass minimum
3. Custom size: As indicated on drawings

2.4 INSULATING GLASS UNITS

A. Double-Glazed Sputter-Coated Insulating Glass Units: Type G4

1. Conformance: ASTM E 2190, Class CBA.
2. Outboard Lite: Sputter-coated clear float glass.
 - a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
 - b. Vacuum Deposition Sputtered Coating: ASTM C 1376.
 - c. Coating on Surface No. 2: SunGuard SuperNeutral 68 (SN 68).
 - d. Glass Thickness: 6 mm (1/4 inch).
 - e. Heat Treatment: Fully tempered where required by code; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
3. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
4. Inboard Lite: Basis of Design: Sunguard SuperNuetral 68 (SN68)
 - a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
 - b. Glass Thickness: 6 mm (1/4 inch).
 - c. Heat-Treatment: Fully tempered where required by code; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
5. Glass Unit Performance Characteristics:
 - a. Visible Light Transmittance: 68 percent
 - b. Visible Light Reflectance Outdoors: 11 percent
 - c. Direct Solar Energy Transmittance: 33 percent
 - d. Direct Solar Energy Reflectance Outdoors: 32 percent
 - e. Winter U-Value Nighttime: 0.29
 - f. Summer U-Value Daytime: 0.28
 - g. Shading Coefficient: 0.43
 - h. Solar Heat Gain Coefficient: 0.38
 - i. Summer Relative Heat Gain: 90
6. Edge Seals: ASTM E 773, with aluminum spacers and silicone sealant for glass-to-spacer seals.

7. Sealant: Approved by glass manufacturer.

C. Double-Glazed Sputter-Coated Insulating Glass Units with Spandrel: Type G5

1. Conformance: ASTM E 2190, Class CBA.
2. Outboard Lite: Sputter-coated clear float glass.
 - a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
 - b. Vacuum Deposition Sputtered Coating: ASTM C 1376.
 - c. Coating on Surface No. 2: Basis of Design: SunGuard SuperNeutral 68 (SN 68).
 - d. Glass Thickness: 6 mm (1/4 inch).
 - e. Heat Treatment: Fully tempered where required by code; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
3. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
4. Inboard Lite: Clear Float with spandrel
 - a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
 - b. Spandrel on Surface #3: ICD Opaci-Coat Standard Architectural Color. Color to be selected by architect. Mock-up of spandrel unit must be furnished for, and approved by, architect prior to installation.
 - c. Glass Thickness: 6 mm (1/4 inch).
 - d. Heat-Treatment: Fully tempered where required by code; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1
5. Glass Unit Performance Characteristics:
 - a. Winter U-Value Nighttime: 0.29
 - b. Summer U-Value Daytime: 0.27
6. Edge Seals: ASTM E 773, with aluminum spacers and silicone sealant for glass-to-spacer seals.
7. Sealant: Approved by glass manufacturer.

C. High Performance Double-Glazed Sputter-Coated Insulating Glass Units: Type G6

1. Conformance: ASTM E 2190, Class CBA.
2. Outboard Lite: Sputter-coated clear float glass.
 - a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
 - b. Vacuum Deposition Sputtered Coating: ASTM C 1376.
 - c. Coating on Surface No. 2: Basis of Design: SunGuard SuperNeutral 54 (SN 54).
 - d. Glass Thickness: 6 mm (1/4 inch).

- e. Heat Treatment: Fully tempered where required by code; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
- 3. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
- 4. Inboard Lite: *Basis of Design: Sunguard SuperNeutral 54 (SN54)*
 - a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
 - b. Glass Thickness: 6 mm (1/4 inch).
 - c. Heat-Treatment: Fully tempered where required by code; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
- 5. Glass Unit Performance Characteristics:
 - a. Visible Light Transmittance: 55 percent
 - b. Visible Light Reflectance Outdoors: 13 percent
 - c. Direct Solar Energy Transmittance: 25 percent
 - d. Direct Solar Energy Reflectance Outdoors: 41 percent
 - e. Winter U-Value Nighttime: 0.29
 - f. Summer U-Value Daytime: 0.27
 - g. Shading Coefficient: 0.33
 - h. Solar Heat Gain Coefficient: 0.28
 - i. Summer Relative Heat Gain: 69
- 6. Edge Seals: ASTM E 773, with aluminum spacers and silicone sealant for glass-to-spacer seals.
- 7. Sealant: Approved by glass manufacturer.
- C. High-Performance Double-Glazed Sputter-Coated Insulating Glass Units with Spandrel: Type G7
 - 1. Conformance: ASTM E 2190, Class CBA.
 - 2. Outboard Lite: Sputter-coated clear float glass.
 - a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
 - b. Vacuum Deposition Sputtered Coating: ASTM C 1376.
 - c. Coating on Surface No. 2: *Basis of Design: SunGuard SuperNeutral 54 (SN 54).*
 - d. Glass Thickness: 6 mm (1/4 inch).
 - e. Heat Treatment: Fully tempered where required by code; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
 - 3. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
 - 4. Inboard Lite: Clear Float with spandrel
 - a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.

- b. Spandrel on Surface #3: ICD Opaci-Coat Standard Architectural Color. Color to be selected by architect. Mock-up of spandrel unit must be furnished for, and approved by, architect prior to installation.
- c. Glass Thickness: 6 mm (1/4 inch).
- d. Heat-Treatment: Fully tempered where required by code; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1
- 5. Glass Unit Performance Characteristics:
 - a. Winter U-Value Nighttime: 0.29
 - b. Summer U-Value Daytime: 0.27
- 6. Edge Seals: ASTM E 773, with aluminum spacers and silicone sealant for glass-to-spacer seals.
- 7. Sealant: Approved by glass manufacturer.

2.5 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 (two inches) except 100 to 150 mm (four to six inches) for insulating glass.
 - 4. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
 - 5. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.
- C. Spacers: ASTM C864:
 - 1. Channel shape having a 6 mm (1/4 inch) internal depth.
 - 2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
 - 3. Lengths: One to 25 to 76 mm (one to three 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 acetoxo cure:
 1. Type S.
 2. Class 25.
 3. Grade NS.
 4. Shore a hardness of 25 to 30 Durometer.
- K. Neoprene, EPDM, or Vinyl Glazing Gasket: ASTM C864.
 1. Channel shape; flanges may terminate above the glazing channel or flush with the top of the channel.
 2. Designed for dry glazing.
- L. Color:
 1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames shall match color of the finished aluminum and be nonstaining.
 2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted shall be black, gray, or neutral color.
- M. Smoke Removal Unit Targets: Adhesive targets affixed to glass to identify glass units intended for removal for smoke control. Comply with requirements of local Fire Department.

2.6 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. VOC Content: For sealants used inside of the weatherproofing system that 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 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.
- 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.
- 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.

3.4 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

- A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 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 silicon type 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 silicone type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.5 INSTALLATION - WET METHOD (SEALANT AND SEALANT)

- A. Place setting blocks at 1/4 points and install glazing pane or unit.
- B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- C. Fill gaps between glazing and stops with silicone type sealant to depth of bite on glazing, but not more than 9 mm (3/8 inch) below sight line to ensure full contact with glazing and continue the air and vapor seal.
- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.6 INSTALLATION - EXTERIOR BUTT GLAZED METHOD (SEALANT ONLY)

- A. Temporarily brace glass in position for duration of glazing process. Mask edges of glass at adjoining glass edges and between glass edges and framing members.
- B. Temporarily secure a small diameter non-adhering foamed rod on back side of joint.
- C. Apply sealant to open side of joint in continuous operation; thoroughly fill the joint without displacing the foam rod. Tool the sealant surface smooth to concave profile.
- D. Permit sealant to cure then remove foam backer rod. Apply sealant to opposite side, tool smooth to concave profile.
- E. Remove masking tape.

3.7 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

- A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.
- B. Place setting blocks at 1/4 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 silicone type sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.8 REPLACEMENT AND CLEANING

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by Resident Engineer.
- 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.

3.9 PROTECTION

- A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

3.10 GLAZING SCHEDULE

- A. Install all respective glazing types at the locations indicated in the drawings.

- - - E N D - - -

SECTION 08 90 00
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies fixed and operable wall louvers, door louvers and wall vents.

1.2 RELATED WORK

- A. Louvers in steel doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- B. 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: Each type, showing material, finish, size of members, method of assembly, and installation and anchorage details.
- C. Manufacturer's Literature and Data: Each type of louver and vent.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. The Master Painters Institute (MPI): Approved Product List - September 2011
- C. American Society for Testing and Materials (ASTM):
 - A167-99(R2009).....Stainless and Heat-Resisting Chromium - Nickel Steel Plate, Sheet, and Strip
 - A1008/A1008M-10.....Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability
 - B209/B209M-03(R2007)....Aluminum and Aluminum Alloy, Sheet and Plate
 - B221-08.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - B221M-07.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire Shapes, and Tubes
- D. National Association of Architectural Metal Manufacturers (NAAMM):
 - AMP 500-06.....Metal Finishes Manual
- E. National Fire Protection Association (NFPA):
 - 90A-09.....Installation of Air Conditioning and Ventilating Systems

- F. American Architectural Manufacturers Association (AAMA):
2605-11.....High Performance Organic Coatings on
Architectural Extrusions and Panels
- G. Air Movement and Control Association, Inc. (AMCA):
500-L-07.....Testing Louvers

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum, Extruded: ASTM B221/B221M.
- B. Stainless Steel: ASTM A167, Type 302B.
- C. Aluminum, Plate and Sheet: ASTM B209/B209M.
- D. Fasteners: Fasteners for securing louvers and wall vents to adjoining construction, except as otherwise specified or shown, shall be toggle or expansion bolts, of size and type as required for each specific type of installation and service condition.
1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.
 2. Fasteners for louvers, louver frames, and wire guards shall be of stainless steel or aluminum.
- E. Inorganic Zinc Primer: MPI No. 19.

2.2 EXTERIOR WALL LOUVERS

- A. General:
1. Provide fixed type louvers of size and design shown.
 2. Heads, sills and jamb sections shall have formed caulking slots or be designed to retain caulking. Head sections shall have exterior drip lip, and sill sections an integral water stop.
 3. Furnish louvers with sill extension or separate sill as shown.
 4. Frame shall be mechanically fastened or welded construction with welds dressed smooth and flush.
- B. Performance Characteristics:
1. Weather louvers shall have a minimum of 55 percent free area and shall pass 306 (1010)mm/s (fpm) free area velocity at a pressure drop not exceeding 44.5 (0.175) mm (inch) water gage and carry not more than 3.1 (0.01) g (ounces) of water per m² (square foot) of free area for 15 minutes when tested per AMCA Standard 500-L.
 2. Louvers shall bear AMCA certified rating seals for air performance and water penetration ratings.

C. Aluminum Louvers:

1. General: Frames, blades, sills and mullions (sliding interlocking type); 2 mm (0.081-inch) thick extruded aluminum. Blades shall be standard drainable type and have reinforcing bosses.
2. Louvers, fixed: Make frame sizes 13 mm (1/2-inch) smaller than openings. Single louvers frames shall not exceed 1700 mm (66 inches) wide. When openings exceed 1700 mm (66 inches), provide twin louvers

D. Stainless Steel Louvers: From stainless steel louvers using 1.6 mm (0.063-inch) thick sheet for frames, blades, sills and mullions.

1. Louver shall have fixed 45 degree standard blades with water baffle. Make overall frame size 13 mm (1/2-inch) less than opening, unless otherwise shown.
2. Single louver sections shall not exceed 1700 mm (66 inches) in width. For openings larger than 1700 mm (66 inches) wide, provide multiple sections not larger than 1700 mm (66 inches) wide separated by mullions.

2.3 CLOSURE ANGLES AND CLOSURE PLATES

- A. Fabricate from 2 mm (0.074-inch) thick stainless steel or aluminum.
- B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.
- C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as specified.

2.4 WIRE GUARDS

- A. Provide wire guards on outside of all exterior louvers, except on exhaust air louvers.
- B. Fabricate frames from 2 mm (0.081-inch) thick extruded or sheet aluminum designed to retain wire mesh.
- C. Wire mesh shall be woven from not less than 1.6 mm (0.063-inch) diameter aluminum wire in 13 mm (1/2-inch) square mesh.
- D. Miter corners and join by concealed corner clips or locks extending about 57 mm (2-1/4 inches) into rails and stiles. Equip wire guards over four feet in height with a mid-rail constructed as specified for frame components.
- E. Fasten frames to outside of louvers with aluminum or stainless steel devices designed to allow removal and replacement without damage to the wire guard or the louver.

2.5 EXTERIOR DOOR LOUVERS

- A. Fabricate of 1.6 mm (0.063-inch) thick extruded aluminum. Miter frames at corners and join by concealed corner brackets.
- B. Equip louvers on outside with wire guards, except omit wire guards for louvers in doors located completely below enclosed areaways.

2.6 INTERIOR DOOR LOUVERS

- A. Fabricate louvers for interior doors and partitions of 1.6 mm (0.063-inch) thick extruded aluminum.
- B. Make louvers sight-proof type with stationary blades, except where light-proof louvers are required.
- C. Lightproof louvers shall have stationary blades and be designed to exclude passage of light but permit free ventilation.

2.7 WALL VENTS

- A. Fabricate exterior wall vents from either 4.7 mm (0.187-inch) thick aluminum plate of 6 mm (1/4-inch) thick cast iron, perforated in diamond lattice pattern, with not over 19 mm (3/4-inch) openings.
- B. Vents shall have aluminum screen frame with aluminum alloy insect screening mounted on back of vent by means of 19 mm x 5 mm (3/4-inch by 3/16-inch) top and bottom bars screwed to grille.
- C. Vent Frames In Masonry: Fabricate of 45 mm x 30 mm x 5 mm (1-3/4 inch by 1-1/4 inch by 3/16-inch) steel angles bolted with 6 mm (1/4-inch) diameter expansion bolts at jambs.

2.8 AIR INTAKE VENTS

- A. Fabricate exterior louvered wall ventilators for fresh air intake for air conditioning units from extruded aluminum, ASTM B221. Form with integral horizontal louvers and frame, with drip extending beyond face of wall and integral water stops.
- B. Provide aluminum closures where shown for inside face of dummy vents.
- C. Provide 0.8 m (0.032-inch) thick aluminum sleeves where shown.

2.9 FINISH

- A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505
- B. Aluminum Louvers, Air Intake Vents and Wire Guards:
 - 1. Anodized finish
 - a. AA-M1X Mill finish, as fabricated.
 - 2. AAMA 2605 (Fluorocarbon coating).
- C. Brick Vents: Sand blasted satin finish.
- D. Stainless Steel: Mechanical finish No. 4 in accordance with NAAMM Metal Finishes Manual.

- E. Steel: Surfaces of steel work, for which no other finish is specified, shall be cleaned free from scale, rust, oil and grease, and then given a light colored prime paint after fabrication, except ferrous metals concealed in finished work. Paint all contact surfaces of assembled work (except welded contact surfaces) with an additional shop coat of similar paint.

2.10 PROTECTION

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous paint (complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.
- B. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.
- C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work. Strippable plastic coating on colored anodized finish is not approved.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set work accurately, in alignment and where 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. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.
- C. Provide anchoring devices and fasteners as shown and as necessary for securing louvers and vents to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use.
- D. Generally, set wall louvers and vents in masonry walls during progress of the work. If wall louvers and vents are not delivered to job in time for installation in prepared openings, make provision for later installation. Set in cast-in-place concrete in prepared openings.

3.2 CLEANING AND ADJUSTING

- A. After installation, all exposed prefinished and plated items and all items fabricated from stainless steel and aluminum shall be cleaned as recommended by the manufacturer and protected from damage until completion of the project.
- B. All movable parts, including hardware, shall be cleaned and adjusted to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have all contact surfaces fit tight and even without forcing or warping the components

- - - E N D - - -

SECTION 09 06 00
SCHEDULE FOR FINISHES

PART I - GENERAL

1.1 DESCRIPTION

This section contains a coordinated system in which requirements for materials specified in other sections shown are identified by abbreviated material names and finish codes in the room finish schedule or shown for other locations.

1.2 MANUFACTURERS

Manufacturer's trade names and numbers used herein are only to identify colors, finishes, textures and patterns. Products of other manufacturer's equivalent to colors, finishes, textures and patterns of manufacturers listed that meet requirements of technical specifications will be acceptable upon approval in writing by contracting officer for finish requirements.

1.3 SUBMITALS

Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES—provide quadruplicate samples for color approval of materials and finishes specified in this section.

1.4 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. MASTER PAINTING INSTITUTE: (MPI)
2001.....Architectural Painting Specification Manual

PART 2- PRODUCTS

2.1 DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

A. SECTION 06 20 00, FINISH CARPENTRY SEE ALSO SECTION 12 32 00, WOOD CASEWORK

1. CASEWORK TYPICALS					
Room No. and Name	Component	Material	Manufacturer / Species	Finish	Color
SSF-1	Countertop	Solid Surface	Corian	Terra collection (LEED)	Oat
	Vertical Surface(s)	Architectural Grade Veneer on ¾" Substrate	Select White Maple	Plane Sliced / Catalyzed Polyurethane	Clear
	Vertical Surface(s)	Laminate	Wilsonart		Fusion Maple 7909
	Trim	Architectural Grade Veneer on ¾" Substrate	Select White Maple	Plane Sliced / Catalyzed Polyurethane	Clear
	Reveal	Architectural Grade Veneer on ¾" Substrate	Select White Maple	Plane Sliced / Catalyzed Polyurethane	Clear
	Drawer and Door Fronts	Laminate	To match Vertical Surface		
	Drawer and Door Interiors	Melamine			White
	Drawer and Door Pulls	Aluminum	Stanley	Satin	Clear

2.2 DIVISION 07 - THERMAL AND MOISTURE PROTECTION

A. SECTION 07 42 16, INSULATED CORE METAL WALL PANELS

Type	Shape	Ext. Finish	Int. Finish	Manufacturer	Mfg. Color Name/No.
2" Insulated	Flat	PVDF	Per Mfg.	Centria	Sage Brown/#9912
3" Insulated	Flat	PVDF	Per Mfg.	Centria	Sage Brown/#9912

B. SECTION 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

Color	Manufacturer	Manufacturer Color Name/No.
White	Carlisle	Sure Seal Ballasted EPDM

2.3 DIVISION 08 - OPENINGS

A. SECTION 08 11 13, HOLLOW METAL DOORS AND FRAMES

Paint both sides of door and frames same color including ferrous metal louvers, and hardware attached to door	
Component	Color of Paint Type and Gloss
HM Door	Color to match adjacent wall
HM Frame	Color to match adjacent wall
Window frame	

B. SECTION 08 14 00, WOOD DOORS

Component	Finish/Color
Doors	Natural Plain Sliced Maple with Clear Coat
Doors	Wilsonart Fusion Maple - 7909
HM Frames	Paint to match adjacent wall
Aluminum Frames	Clear Anodized

C. SECTION 08 31 13, ACCESS DOORS AND FRAMES

Material	Finish/Color
Steel	Paint to match adjacent surfaces

D. SECTION 08 33 13, COILING COUNTER DOORS

Location	Item	Material	Finish	Manufacturer	Manufacturer Color Name/No.
CCD-1	Fire Rated Shutter	Stainless steel	Mill	Cookson	----

E. SECTION 08 41 13, INTERIOR ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

Material	Finish	Manufacturer	Manufacturer Color Name/No.
Aluminum	Clear Anodized	Kawneer	Clear #14

F. SECTION 08 56 19, PASS WINDOWS

Room Name	Finish	Glazing	Manufacturer	Mfg. Color Name/No.
Ward Clerk		G-6 (Skyline: SO #137637-001 Organics Custom Asian Grass)		

G. WINDOW SILLS

Room No. and Name	Material	Finish
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	Aluminum (With Windows)	
At exterior windows	SSF-2	Corian color TBD
	SECTION 04 72 00,CAST STONE MASONRY	

H. SECTION 08 80 00, GLAZING

Glazing Type	Manufacturer	Mfg. Color Name/No.
G-2	----	Clear Tempered
G-4	Guardian Industries	Insulated Glass Unit Surface No. 2: SunGuard SuperNeutral 68 (SN 68)
G-5	Guardian Industries	Insulated Glass Unit Surface No. 2: SunGuard SuperNeutral 68 (SN 68) Surface No. 3: Spandrel
G-6	Guardian Industries	Insulated Glass Unit - High Performance Surface No. 2: SunGuard SuperNeutral 54 (SN 54)
G-7	Guardian Industries	Insulated Glass Unit - High Performance Surface No. 2: SunGuard SuperNeutral 54 (SN 54) Surface No. 3: Spandrel
G-8	Skyline	SO #137637-003 Organics Custom Asian Grass (nurse)
G-9	Skyline	SO #137637-001 Organics Custom Asian Grass (ward clerk)

2.3 DIVISION 09 - FINISHES

A. SECTION 09 30 13, PORCELAIN TILE

7. SECTION 09 30 13, PORCELAIN TILE (PPT)					
Finish Code	Size	Shape	Pattern	Manufacturer	Mfg. Color Name/No.
PPT-1 (floor)	12" x 24"	Rectangular	Shades	Crossville	Fog AV243 UPS
PPT-2 (wall)	6" x 24"	Rectangular	Shades	Crossville	Vapor AV242 Honed
PPT-3 (accent)	1" x 3"	Rectangular - Mosaic	Shades	Crossville	SBC1/.10103HMOS warm greys
PPT-4 (base)	6" x 12"	Cove Base	Shades	Crossville	Vapor AV242 Honed
PPT-5 (trim)	4" x 24"	Single Bullnose	Shades	Crossville	Vapor AV242 Honed

8. SECTION 09 30 13, PORCELAIN TILE GROUT		
Finish Code	Manufacturer	Mfg. Color Name/No.
GR-1	Quartzlock 2	Mushroom 224
GR-2	Quartzlock 2	Wheat 245

11. SECTION 09 30 13, METAL DIVIDER STRIPS		
Size	Material	Manufacturer
As required	Aluminum	Schluter

. SECTION 09 51 00, ACOUSTICAL CEILINGS

Finish Code	Component	Color Pattern	Manufacturer	Mfg Name/No.
	Exposed Suspension System	White Aluminum	Armstrong	AlPrelude plus XL
AT-1	2x2 ACT	White	Armstrong	Cirrus Angled Tegular 572
AT-3	2x2 ACT	White	Armstrong	Optima Health Zone 3214

I. SECTION 09 65 19, RESILIENT TILE FLOORING (SOLID VINYL FLOOR TILE)

Finish Code	Size	Material/Component	Manufacturer	Mfg Name/No.
SVT-1	4" x 36"	LVT	Mannington	Nature's Paths American Walnut 12126 Cocoa
SVT-2	18" x 18"	LVT	Mannington	Nature's Paths Dissolve Etch 12330

K. SECTION 09 65 16, VINYL SHEET FLOORING, HEAT WELDED SEAMS (WSF)

Finish Code	Pattern name	Manufacturer	Mfg. Color Name/No.
WSF-1	Intersect	Mannington	Exemplar PAR102
WSF-2	Realities Boardwalk	Mannington	Sparrow 5662
WSF-3	Intersect	Mannington	Calibar PAR108

1. SECTION 09 65 16, WELDING RODS (WSF)		
Finish code	Manufacturer	Mfg. Color Name/No.
	Mannington	To match WSF-1, WSF-2, WSF-3

2. SECTION 09 65 16, CAP STRIPS (WSF)		
Finish Code	Manufacturer	Mfg. Color Name/No.
	Per sheet vinyl manufacturer	To be selected from Mfg. standard colors

L. SECTION 09 65 13, RESILIENT BASE AND ACCESSORIES

Finish Code	Item	Height	Manufacturer	Mfg Name/No.
RB-1	Rubber Base (RB)	6"	Johnsonite	Millwork Mandalay color 80 Fawn

M. SECTION 09 68 00, CARPET (CP)

1. SECTION 09 68 00, CARPET EDGE STRIP			
Finish Code	Material	Manufacturer	Mfg. Color Name/No.
	Vinyl	Johnsonite	80 Fawn

N. SECTION 09 68 00, CARPET MODULES (CPT)(CARPET TILE)

Finish Code	Size	Pattern direction	Manufacturer	Mfg. Color Name/No.
CPT-1	24" x 24"		Shaw	Veil 33761 Moonlight

P. SECTION 09 67 23, EPOXY RESINOUS FLOORING (ERF)

Finish code	Manufacturer	Mfg. Color Name/No.
ERF-1	Stonhard	Stontec ERF Ivory Coast

Q. SECTION 09 91 00, PAINT AND COATINGS

1. MPI Gloss and Sheen Standards

		Gloss @60	Sheen @85
Gloss Level 1	a traditional matte finish-flat	max 5 units, and	max 10 units
Gloss Level 2	a high side sheen flat-"a velvet-like" finish	max 10 units, and	10-35 units
Gloss Level 3	a traditional "egg-shell like" finish	10-25 units, and	10-35 units
Gloss Level 4	a "satin-like" finish	20-35 units, and	min. 35 units
Gloss Level 5	a traditional semi-gloss	35-70 units	
Gloss Level 6	a traditional gloss	70-85 units	
Gloss level 7	a high gloss	more than 85 units	

2. Paint code	Gloss	Manufacturer	Mfg. Color Name/No.
P-1	Level 3	Kelly Moore	KM3970-1 Meadow Day
P-2	Level 3	Kelly Moore	KM5791-1 Northpointe
P-3	Level 3	Kelly Moore	KM5810-3 London Square
P-4	Level 3	Kelly Moore	KM4775-2 Chameleon Tango

P-5	Level 3	Kelly Moore	KMA 43-5 Queen of Hearts
PE-1 (epoxy)	Level 5	Kelly Moore	KM3970-1 Meadow Day

2.10 DIVISION 10 - SPECIALTIES

A. SECTION 10 11 13 MARKERBOARDS

Room No. and Name	Component	Material	Manufacturer	Mfg. Color Name/No.
Patient Rooms (F3050)	Magnetic Markerboard, Glass	Vitracolor	Skyline	TBD
Z3050	Whiteboard Dryerase			

B. SECTION 10 26 00, WALL GUARDS AND CORNER GUARDS

Item	Material	Manufacturer	Mfg. Color Name/No.
WCG-1 Corner Guards	Stainless Steel	CS Acrovyn	CO series Stainless Steel 90 degree
WCG-1A Corner Guards	Stainless Steel	CS Acrovyn	CO series Stainless Steel 135 degree
WCG-2 Corner Guards	PVC-free, Acrovyn 4000	CS Acrovyn	SM series - 209 Slate 90 degree
WCG-2A Corner Guards	PVC-free, Acrovyn 4000	CS Acrovyn	SM series - 209 Slate, 120 degree
WCG-2B Corner Guards	PVC-free, Acrovyn 4000	CS Acrovyn	SM series - 209 Slate, 130 degree
WCG-2C Corner Guards	PVC-free, Acrovyn 4000	CS Acrovyn	SM series - 209 Slate, 140 degree
WCG-2D Corner Guards	PVC-free, Acrovyn 4000	CS Acrovyn	SM series - 209 Slate 150 degree

WG-1 Wall Guard	PVC-free, Acrovyn 4000	CS Acrovyn	209 Slate, overall 34"-40" AFF
WG-2 Wall Guard	PVC-free, Acrovyn 4000	CS Acrovyn	209 Slate, overall 54"h AFF
WR-1 Wall Rail - Handrail	Stainless Steel	CS Acrovyn	P-OMS Series Handrail with Crash Rail, Stainless Steel
WR-2 Wall Rail - Bumper Guard	Stainless Steel	CS Acrovyn	ERC Series Bumper Guard, Stainless Steel
WR-3 Wall Rail Trim	PVC-free	CS Acrovyn	FR255, 2-1/4" trim, color 372 Classic Maple

C. SECTION 10 51 23, FLOOR OR BASE MOUNTED LOCKERS, PHENOLIC

Item	Material	Manufacturer	Mfg. Color Name/No.
Doors & Side panels	Phenolic	ASI Storage Solutions	To be selected from mfg. standard color selection

2.12 DIVISION 11- EQUIPMENT

A. SECTION 11 73 00, CEILING MOUNTED PATIENT LIFT SYSTEM

Item	Material	Manufacturer/Product	Manufacturer Name/No.
Ceiling track	Aluminum	Arjo Huntleigh	Maxi Sky 600 (1000 at bariatric rooms)

2.12 DIVISION 12- FURNISHINGS

A. SECTION 12 24 00, WINDOW SHADES

Component	Material	Manufacturer	Mfg. Color Name/No.
Shade Cloth	Thermoplastic olefin (TPO)	MechoShade	EcoVeil Dense Basket Weave Shadecloth 1350 Series color TBD

2.13 DIVISION 13 - SPECIAL CONSTRUCTION

A. SECTION 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON STRUCTURAL COMPONENTS

Item	Location	Finish	Color
As required	If exposed	Match adjacent finish	Match adjacent wall color

2.16 DIVISION 22 - PLUMBING

A. SECTION 22 40 00, PLUMBING FIXTURES

Fixture Type	Exterior Finish	Color
See Plumbing Fixture Schedule	See Plumbing Fixture Schedule	See Plumbing Fixture Schedule

2.16 DIVISION 26 - ELECTRICAL

A. SECTION 26 51 00, BUILDING LIGHTING INTERIOR

Fixture Type	Exterior Finish	Color
See Electrical Fixture Schedule	See Electrical Fixture Schedule	See Electrical Fixture Schedule

PART III EXECUTION

3.1 FINISH SCHEDULES & MISCELLANEOUS ABBREVIATIONS

FINISH SCHEDULE & MISCELLANEOUS ABBREVIATIONS	
Term	Abbreviation
Access Flooring	AF
Accordion Folding Partition	AFP
Acoustical Ceiling	AT
Acoustical Ceiling, Special Faced	AT (SP)
Acoustical Metal Pan Ceiling	AMP
Acoustical Wall Panel	AWP
Acoustical Wall Treatment	AWT
Acoustical Wallcovering	AWF
Anodized Aluminum Colored	AAC
Anodized Aluminum Natural Finish	AA
Baked On Enamel	BE
Brick Face	BR
Brick Flooring	BF
Brick Paving	BP
Carpet	CP
Carpet Athletic Flooring	CAF
Carpet Module Tile	CPT
Ceramic Glazed Facing Brick	CGFB
Ceramic Mosaic Tile	FTCT
Concrete	C
Concrete Masonry Unit	CMU
Divider Strips Marble	DS MB

Epoxy Coating	EC
Epoxy Resin Flooring	ERF
Existing	E
Exposed Divider Strips	EXP
Exterior	EXT
Exterior Finish System	EFS
Exterior Paint	EXT-P
Exterior Stain	EXT-ST
Fabric Wallcovering	WF
Facing Tile	SCT
Feature Strips	FS
Floor Mats & Frames	FM
Floor Tile, Mosaic	FT
Fluorocarbon	FC
Folding Panel Partition	FP
Foot Grille	FG
Glass Masonry Unit	GUMU
Glazed Face CMU	GCMU
Glazed Structural Facing Tile	SFTU
Granite	GT
Gypsum Wallboard	GWB
High Glazed Coating	SC
Latex Mastic Flooring	LM
Linear Metal Ceiling	LMC
Linear Wood Ceiling	LWC
Marble	MB
Material	MAT
Mortar	M
Multi-Color Coating	MC
Natural Finish	NF
Paint	P
Paver Tile	PVT
Perforated Metal Facing	PMF

(Tile or Panels)	
Plaster	PL
Plaster High Strength	HSPL
Plaster Keene Cement	KC
Plastic Laminate	HPDL
Polypropylene Fabric Wallcovering	PFW
Porcelain Paver Tile	PPT
Quarry Tile	QT
Radiant Ceiling Panel System	RCP
Resilient Stair Tread	RST
Rubber Base	RB
Rubber Tile Flooring	RT
Spandrel Glass	SLG
Stain	ST
Stone Flooring	SF
Structural Clay	SC
Suspension Decorative Grids	SDG

Grids	
Terrazzo Portland Cement	PCT
Terrazzo Tile	TT
Terrazzo, Thin Set	
Textured Gypsum Ceiling Panel	TGC
Textured Metal Ceiling Panel	TMC
Thin set Terrazzo	TST
Veneer Plaster	VP
Vinyl Base	VB
Vinyl Coated Fabric Wallcovering	W
Vinyl Composition Tile	VCT
Vinyl Sheet Flooring	VSF
Vinyl Sheet Flooring (Welded Seams)	WSF
Wall Border	WB
Wood	WD

3.2 ROOM FINISH SCHEDULE

A. Match adjoining or existing similar surfaces colors, textures or patterns where disturbed or damaged by alterations or new work when not scheduled.

B. ROOM FINISH SCHEDULE: See drawings for Room Finish Schedule.

--- E N D---

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies steel studs wall systems, shaft wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board, plaster bases or other building boards.

1.2 RELATED WORK

- A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
- B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- C. Pull down tabs in steel decking: Section 05 36 00, COMPOSITE METAL DECKING.
- D. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS, Section 09 29 00, GYPSUM BOARD.

1.3 TERMINOLOGY

- A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.
- C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Studs, runners and accessories.
 - 2. Hanger inserts.
 - 3. Channels (Rolled steel).
 - 4. Furring channels.
 - 5. Screws, clips and other fasteners.
- C. Shop Drawings:
 - 1. Typical ceiling suspension system.
 - 2. Typical metal stud and furring construction system including details around openings and corner details.

3. Typical shaft wall assembly
 4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.
- D. Test Results: Fire rating test designation, each fire rating required for each assembly.
- E. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

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)
- A123-09.....Zinc (Hot-dip Galvanized) Coatings on Iron and Steel Products
- A653/A653M-09.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
- A641-09.....Zinc-Coated (Galvanized) Carbon Steel Wire
- C11-10.....Terminology Relating to Gypsum and Related Building Materials and Systems
- C635-07.....Manufacture, Performance, and Testing of Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings
- C636-08.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
- C645-09.....Non-Structural Steel Framing Members
- C754-11.....Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
- C841-03(R2008).....Installation of Interior Lathing and Furring
- C954-10.....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

C1002-07..... Steel Self-Piercing Tapping Screws for the
Application of Gypsum Panel Products or Metal
Plaster Bases to Wood Studs or Steel Studs
E580-11.....Application of Ceiling Suspension Systems for
Acoustical Tile and Lay-in Panels in Areas
Requiring Moderate Seismic Restraint.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2.2 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.

2.3 STEEL STUDS AND RUNNERS (TRACK)

- A. ASTM C645, modified for thickness specified and sizes as shown.
1. Use ASTM A525 steel, 0.8 mm (0.0329-inch) thick bare metal (33 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.

2.4 FURRING CHANNELS

- A. Rigid furring channels (hat shape): ASTM C645.
- B. Resilient furring channels:
1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
 2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens

fastener surface but shall not contact anchorage surface other channel leg is attached to.

C. "Z" Furring Channels:

1. Not less than 0.45 mm (0.0179-inch)-thick 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.

D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.5 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

A. ASTM C754, except as otherwise specified.

B. For fire rated construction: Type and size same as used in fire rating test.

C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.

D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.

E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.

F. Tie Wire and Hanger Wire:

1. ASTM A641, soft temper, Class 1 coating.
2. Gage (diameter) as specified in ASTM C754 or ASTM C841.

G. Attachments for Wall Furring:

1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.
2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.

H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

2.6 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.

2.7 DEFLECTION TRACKS

- A. Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated: in thickness not less than indicated for studs and in width to accommodate depth of studs.
- B. Non-rated Track: Top Runner manufactured to allow partition heads to expand and contract with movement of the structure in thickness not less than indicated for studs and width to accommodate depth of studs.

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, sound rated partitions and insulated exterior wall furring.
- F. 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.

G. 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.

H. Chase Wall Partitions:

1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).

I. 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.

J. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.

B. Wall furring-Stud System:

1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.

C. Direct attachment to masonry or concrete; rigid channels or "Z" channels:

1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.
2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.
3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.

6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.

D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.

3.4 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.

B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.5 INSTALLING SHAFT WALL SYSTEM

A. Conform to UL Design No. U438 for two-hour fire rating.

B. Position J runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural supports with power driven fasteners at both ends and 600 mm (24 inches) on center.

C. After liner panels have been erected, cut C-H studs and E studs, from 9 mm (3/8-inch) to not more than 13 mm (1/2-inch) less than floor-to-ceiling height. Install C-H studs between liner panels with liner panels inserted in the groove.

D. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.

E. Suitably frame all openings to maintain structural support for wall:

1. Provide necessary liner fillers and shims to conform to label frame requirements.

2. Frame openings cut within a liner panel with E studs around perimeter.

3. Frame openings with vertical E studs at jambs, horizontal J runner at head and sill.

F. Elevator Shafts:

1. Frame elevator door frames with 0.87 mm (0.0341-inch) thick J strut or J stud jambs having 75 mm (three-inch) long legs on the shaft side.

2. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.

3. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

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 pull down tabs when available.
 2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.
- 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 power actuated fasteners either eye pin, threaded studs or drive pins for type of hanger attachment required.
 2. Install fasteners at approximate mid height of concrete beams or joists. Do not install in bottom of beams or joists.
- E. Steel decking without concrete topping:
 1. Do not fasten to steel decking 0.76 mm (0.0299-inch) or thinner.
 2. Toggle bolt to decking 0.9 mm (0.0359-inch) or thicker only where anchorage to steel framing is not possible.
- F. Installing suspended ceiling system for gypsum board (ASTM C635 Option):
 1. Install only for ceilings to receive screw attached gypsum board.
 2. Install in accordance with ASTM C636.
 - 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.)

- - - E N D - - -

SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies installation and finishing of gypsum board.

1.2 RELATED WORK

- A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- B. Sound deadening board: Section 07 21 13, THERMAL INSULATION.
- C. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.
- D. Lay in gypsum board ceiling panels: Section 09 51 00, ACOUSTICAL CEILING.

1.3 TERMINOLOGY

- A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.
- C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Cornerbead and edge trim.
 - 2. Finishing materials.
 - 3. Laminating adhesive.
 - 4. Gypsum board, each type.
- C. Shop Drawings:
 - 1. Typical gypsum board installation, showing corner details, edge trim details and the like.
 - 2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
 - 3. Typical shaft wall assembly.
 - 4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.
- D. Samples:
 - 1. Cornerbead.

2. Edge trim.
3. Control joints.

E. Test Results:

1. Fire rating test, each fire rating required for each assembly.
2. Sound rating test.

F. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost for each regionally manufactured material.
 - a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
3. Product data for Credit IEQ 4.1: For adhesives used to laminate gypsum Board panels to substrates, including printed statement of VOC content.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

In accordance with the requirements of ASTM C840.

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing And Materials (ASTM):
 - C11-08.....Terminology Relating to Gypsum and Related Building Materials and Systems
 - C475-02.....Joint Compound and Joint Tape for Finishing Gypsum Board
 - C840-08.....Application and Finishing of Gypsum Board
 - C919-08.....Sealants in Acoustical Applications
 - 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. (2.84mm) in thickness

C1002-07.....Steel Self-Piercing Tapping Screws for the
Application of Gypsum Panel Products or Metal
Plaster Bases to Wood Studs or Steel Studs
C1047-05.....Accessories for Gypsum Wallboard and Gypsum
Veneer Base
C1396-06.....Gypsum Board
E84-08.....Surface Burning Characteristics of Building
Materials

- C. Underwriters Laboratories Inc. (UL):
Latest Edition.....Fire Resistance Directory
D. Inchcape Testing Services (ITS):
Latest Editions.....Certification Listings

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Recycled Content: Provide products with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 20 percent.

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. Acoustically Rated Gypsum Board: ASTM C1396, Type X, 15.9mm (5/8" inch) thick. Assembly to have a minimum STC of 45 tested per ASTM E90.
C. Coreboard or Shaft Wall Liner Panels.
1. ASTM C1396, Type X.
2. 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. Gypsum cores shall contain maximum percentage of post industrial recycled gypsum content available in the area (a minimum of 95 percent post industrial recycled gypsum content). Paper facings shall contain 100 percent post-consumer recycled paper content.

2.3 GYPSUM SHEATHING BOARD

- A. ASTM C1396, Type X, water-resistant core, 16 mm (5/8 inch) thick.
B. ASTM C1177, Type X.

2.4 ACCESSORIES

- A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.

- B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

2.5 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 AND LAMINATING ADHESIVE

- A. ASTM C475 and ASTM C840. Free of antifreeze, vinyl adhesives, preservatives, biocides and other VOC.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 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.
 - f. Partitions with suspended ceilings on one or both sides.
 - 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. At ceiling of suspended gypsum board ceilings.
2. At existing ceilings.

3.2 INSTALLING GYPSUM BOARD

- A. Coordinate installation of gypsum board with other trades and related work.
- B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.
- C. Moisture and Mold-Resistant Assemblies: Provide and install moisture and mold-resistant glass mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 where shown and in locations which might be subject to moisture exposure during construction.
- D. Use gypsum boards in maximum practical lengths to minimize number of end joints.
- E. Bring gypsum board into contact, but do not force into place.
- F. Ceilings:
 1. For single-ply construction, use perpendicular application.
 2. For two-ply assemblies:
 - a. Use perpendicular application.
 - b. Apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.
- G. Walls (Except Shaft Walls):
 1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
 2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
 3. Stagger screws on abutting edges or ends.
 4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
 5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
 6. For three-ply gypsum board assemblies, apply plies in same manner as for two-ply assemblies, except that heads of fasteners need only be driven flush with surface for first and second plies. Apply third ply

- of wallboard in same manner as second ply of two-ply assembly, except use fasteners of sufficient length enough to have the same penetration into framing members as required for two-ply assemblies.
7. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
 8. Installing Two Layer Assembly Over Sound Deadening Board:
 - a. Apply face layer of wallboard vertically with joints staggered from joints in sound deadening board over framing members.
 - b. Fasten face layer with screw, of sufficient length to secure to framing, spaced 300 mm (12 inches) on center around perimeter, and 400 mm (16 inches) on center in the field.
 9. Control Joints ASTM C840 and as follows:
 - a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
 - b. Not required for wall lengths less than 9000 mm (30 feet).
 - c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.
 - H. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:
 1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
 2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
 3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.
 - I. Electrical and Telecommunications Boxes:
 1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.
 - J. Accessories:
 1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
 2. Install in one piece, without the limits of the longest commercially available lengths.
 3. Corner Beads:
 - a. Install at all vertical and horizontal external corners and where shown.

- b. Use screws only. Do not use crimping tool.
- 4. Edge Trim (casings Beads):
 - a. At both sides of expansion and control joints unless shown otherwise.
 - b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
 - c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
 - d. Where shown.

3.3 INSTALLING GYPSUM SHEATHING

- A. Install in accordance with ASTM C840, except as otherwise specified or shown.
- B. Use screws of sufficient length to secure sheathing to framing.
- C. Space screws 9 mm (3/8 inch) from ends and edges of sheathing and 200 mm (8 inches) on center. Space screws a maximum of 200 mm (8 inches) on center on intermediate framing members.
- D. Apply 600 mm by 2400 mm (2 foot by 8 foot) sheathing boards horizontally with tongue edge up.
- E. Apply 1200 mm by 2400 mm or 2700 mm (4 ft. by 8 ft. or 9 foot) gypsum sheathing boards vertically with edges over framing.

3.4 CAVITY SHAFT WALL

- A. Coordinate assembly with Section 09 22 16, NON-STRUCTURAL METAL FRAMING, for erection of framing and gypsum board.
- B. Conform to UL Design No. U438 or FM WALL CONSTRUCTION 12-2/HR (Nonbearing for two-hour fire rating. Conform to FM WALL CONSTRUCTION 25-1/HR (Non-loadbearing) for one-hour fire rating where shown.
- C. Cut coreboard (liner) panels 25 mm (one inch) less than floor-to-ceiling height, and erect vertically between J-runners on shaft side.
 - 1. Where shaft walls exceed 4300 mm (14 feet) in height, position panel end joints within upper and lower third points of wall.
 - 2. Stagger joints top and bottom in adjacent panels.
 - 3. After erection of J-struts of opening frames, fasten panels to J-struts with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
- D. Gypsum Board:
 - 1. Two hour wall:
 - a. Erect base layer (backing board) vertically on finish side of wall with end joints staggered. Fasten base layer panels to studs with 25 mm (one inch) long screws, spaced 600 mm (24 inches) on center.

- b. Use laminating adhesive between plies in accordance with UL or FM if required by fire test.
- c. Apply face layer of gypsum board required by fire test vertically over base layer with joints staggered and attach with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
- 2. One hour wall with one layer on finish side of wall: Apply face layer of gypsum board vertically. Attach to studs with screws of sufficient length to secure to framing, spaced 300 mm (12 inches) on center in field and along edges.
- 3. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.
- E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.

3.5 FINISHING OF GYPSUM BOARD

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for all finished areas open to public view.
- B. Before proceeding with installation of finishing materials, assure the following:
 - 1. Gypsum board is fastened and held close to framing or furring.
 - 2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.
- C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of non-decorated smoke barrier, fire rated and sound rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier, fire rated and sound rated construction. Sanding is not required of non decorated surfaces.

3.6 REPAIRS

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.
- B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.

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SECTION 09 30 13
CERAMIC/PORCELAIN TILING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies ceramic, porcelain tile, waterproofing membranes for thin-set applications and tile backer board.

1.2 RELATED WORK

- A. Sealing of joints where specified: Section 07 92 00, JOINT SEALANTS.
- B. 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.
- C. Metal and resilient edge strips at joints with new resilient flooring Section 09 65 19, RESILIENT TILE FLOORING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
1. Base tile, each type, each color, each size.
 2. Porcelain tile, each type, color, patterns and size.
 3. Wall (or wainscot) tile, each color, size and pattern.
 4. 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. Porcelain tile, marked to show each type, size, and shape required.
 2. Chemical resistant mortar and grout (Urethane, epoxy and furan).
 3. Cementitious backer unit.
 4. Dry-set Portland cement mortar and grout.
 5. Divider strip.
 6. Elastomeric membrane and bond coat.
 7. Reinforcing tape.
 8. Leveling compound.
 9. Latex-Portland cement mortar and grout.
 10. Commercial Portland cement grout.
 11. Organic adhesive.
 12. Slip resistant tile.
 13. Waterproofing isolation membrane.
 14. Fasteners.
- D. Certification:

1. Master grade, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
 - a. Chemical resistant mortar and grout (Urethane, epoxy and furan).
 - b. Modified epoxy emulsion.
 - c. Commercial Portland cement grout.
 - d. Cementitious backer unit.
 - e. Dry-set Portland cement mortar and grout.
 - f. Elastomeric membrane and bond coat.
 - g. Reinforcing tape.
 - h. Latex-Portland cement mortar and grout.
 - i. Leveling compound.
 - j. Organic adhesive.
 - k. Waterproof isolation membrane.
 - l. Factory mounted tile suitability for application in wet area specified under 2.1, A, 3 with list of successful in-service performance locations.

E. LEED Submittals:

1. Product data for credit IEQ 4.1: For adhesives and sealants, including printed statement of VOC content.

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):
 - A108.1A-11.....Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar
 - A108.1B-11.....Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with dry-Set or latex-Portland Cement Mortar
 - A108.1C-11.....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
 - A137.1-08.....Ceramic Tile

C. American Society For Testing And Materials (ASTM):

- A185-07.....Steel Welded Wire Fabric, Plain, for Concrete
Reinforcing
- C109/C109M-11.....Standard Test Method for Compressive Strength of
Hydraulic Cement Mortars (Using 2 inch. or [50-
mm] Cube Specimens)
- C241-09.....Abrasion Resistance of Stone Subjected to Foot
Traffic
- C348-08.....Standard Test Method for Flexural Strength of
Hydraulic-Cement Mortars
- C627-10.....Evaluating Ceramic Floor Tile Installation
Systems Using the Robinson-Type Floor Tester
- C954-11.....Steel Drill Screws for the Application of Gypsum
Board on Metal Plaster Base to Steel Studs from
0.033 in (0.84 mm) to 0.112 in (2.84 mm) in
thickness
- C979-10.....Pigments for Integrally Colored Concrete
- C1002-07.....Steel Self-Piercing Tapping Screws for the
Application of Panel Products
- C1027-09.....Determining "Visible Abrasion Resistance on
Glazed Ceramic Tile"
- C1028-07.....Determining the Static Coefficient of Friction
of Ceramic Tile and Other Like Surfaces by the
Horizontal Dynamometer Pull Meter Method
- C1127-09.....Standard Guide for Use of High Solids Content,
Cold Liquid-Applied Elastomeric Waterproofing
Membrane with an Integral Wearing Surface
- C1178/C1178M-11.....Standard Specification for Coated Glass Mat
Water-Resistant Gypsum Backing Panel
- C1325-08.....Non-Asbestos Fiber-Mat Reinforced Cementitious
Backer Units
- D4397-10.....Standard Specification for Polyethylene Sheeting
for Construction, Industrial and Agricultural
Applications
- D5109-99(R2004).....Standard Test Methods for Copper-Clad
Thermosetting Laminates for Printed Wiring
Boards

D. Tile Council of America, Inc. (TCA):

- 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 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:
 - c. Porcelain Paver Tile: Matte surface finish
 - 4. Mosaic tile may be mounted or joined together by a resinous bonding material along tile edges.
 - 5. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.
 - 6. Factory-Applied Temporary Protective Coating:
 - a. Protect exposed face surfaces (top surface) of tile against adherence of mortar and grout by pre-coating with a continuous film of petroleum paraffin wax, applied hot.
 - b. Do not coat unexposed tile surfaces.
 - c. Pre-wax tiles set or grouted with latex modified mortars.
- B. 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.
- C. Trim Shapes:
 - 1. Conform to applicable requirements of adjoining floor and wall tile.
 - 2. Use trim shapes sizes conforming to size of adjoining field wall tile unless detailed or specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
 - 3. Internal and External Corners:

- a. Square internal and external corner joints are not acceptable.
- b. External corners including edges: Use bullnose shapes.
- c. Internal corners: Use cove shapes.
- d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.
- e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.
- f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.
- g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.

2.5 SETTING MATERIALS OR BOND COATS

- A. Conform to TCA Handbook for Ceramic Tile Installation.
- B. Portland Cement Mortar: ANSI A108.1.
- C. Latex-Portland Cement Mortar: ANSI A108.1.
 1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A108.1.
 2. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of Portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
- D. Dry-Set Portland Cement Mortar: ANSI A108.1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A108.4.
- E. Organic Adhesives: ANSI A108.1, Type 1.
- F. Elastomeric Waterproofing Membrane and Bond Coat:
 1. TCA F122-02.
 2. ANSI A108.1.
 3. One component polyurethane, liquid applied material having the following additional physical properties:
 - a. Hardness: Shore "A" between 40-60.
 - b. Elongation: Between 300-600 percent.
 - c. Tensile strength: Between 40-60 psig.
 - d. No volatile compounds.
 4. Coal tar modified urethanes are not acceptable.
- G. Waterproofing Isolation Membrane:
 1. Sheet System TCA F122-02.
 2. Optional System to elastomeric waterproof membrane.

3. Composite sheet consisting of ASTM D5109, Type II, Grade I Chlorinated Polyethylene (CM) sheet reinforced on both sides with a non-woven polyester fiber.
4. Designed for use in wet areas as an isolation and positive waterproofing membranes for thin-set bonding of sheet to substrate and thin-set bonding of ceramic and porcelain tile or marble to sheet. Suited for both horizontal and vertical applications.
5. Conform to the following additional physical properties:

Property	Units	Results	Test Method
Hardness Shore A	Points	70-80	ASTM D2240 (10 Second Reading)
Shrinkage	Percent	5 maximum	ASTM D1204
Brittleness		No crack remains flexible at temperature-37 degrees C (-25 degrees F)	ASTM D2497 13 mm (1/2- inch) Mandrel Bend
Retention of Properties after Heat Aging	Percent of original	80 Tensile 80 Breaking 80 Elongation	ASTM D3045, 90 degrees C (194 degrees F) for 168 hours

6. Manufacturer's standard sheet size with prefabricated or preformed inside and outside corners.
7. Sheet manufacturer's solvent welding liquid or xylene and edge sealant.

2.7 GROUTING MATERIALS

A. Coloring Pigments:

1. Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.
2. Add coloring pigments to grout by the manufacturer.
3. Job colored grout is not acceptable.

B. Urethane Grout:

1. Basis of Design Product:
Quartzlock 2 Urethane Grout
2. Meets and exceeds applicable portion of ANSI 118.3 epoxy standard
3. Low VOC (meets LEED EQ 4.1 low-emitting materials)

2.8 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.

2.10 METAL DIVIDER STRIPS

- A. Embedded leg perforated and deformed for keying to mortar.
- B. Aluminum as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.11 WATER

- A. Clean, potable and free from salts and other injurious elements to mortar and grout materials.

2.12 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.

2.13 FLOOR MORTAR BED REINFORCING

ASTM A185 welded wire fabric without backing, MW3 x MW3 (2 x 2-W0.5 x W0.5).

2.14 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 latex-Portland cement mortar or organic adhesive setting materials is used.

3.3 SURFACE PREPARATION

- A. 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.

- B. Additional preparation of concrete floors for tile set with epoxy, or furan-resin shall be in accordance with the manufacturer's printed instructions.
- C. Cleavage Membrane:
 - 1. Install polythene sheet as cleavage membrane in depressed slab when waterproof membrane is not scheduled or indicated.
 - 2. Turn up at edge of depressed floor slab to top of floor.
- D 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.
- E. 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 A108.1 except as specified otherwise.
- C. Install units horizontally or vertically to minimize joints with end joints over framing members. Units with rounded edges; face rounded edge away from studs to form a V joint for joint treatment.
- D. Secure cementitious backer units to each framing member with screws spaced not more than 200 mm (eight inches) on center and not closer than 13 mm (1/2 inch) from the edge of the backer unit or as recommended by

backer unit manufacturer. Install screws so that the screw heads are flush with the surface of the backer unit.

- E. Where backer unit joins shower pans or waterproofing, lap backer unit over turned up waterproof system. Install fasteners only through top one-inch of turned up waterproof systems.
- F. Do not install joint treatment for seven days after installation of cementitious backer unit.
- G. Joint Treatment:
 - 1. Fill horizontal and vertical joints and corners with latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.
 - 2. Leave 6 mm (1/4 inch) space for sealant at lips of tubs, sinks, or other plumbing receptors.

3.5 GLASS MAT WATER-RESISTANT GYPSUM BACKER BOARD

- A. Install in accordance with manufacturer's instructions. TCA Systems W245-01.
- B. Treat joints with tape and latex-Portland cement mortar or adhesive.

3.7 METAL DIVIDER STRIPS

- A. Install metal divider strips in floor joints 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.
 - 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.

3.8 TILE - GENERAL

- A. Workmanship:
 - 1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.
 - 2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise.
 - 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:

- 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.

3.10 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH DRY-SET PORTLAND CEMENT AND LATEX-PORTLAND CEMENT MORTAR

- A. Installation of Tile: ANSI A108.1, except as specified otherwise.

3.11 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH ORGANIC ADHESIVE

- Installation of Tile: ANSI A108.1.

3.13 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 A108.1 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 at aggregate surfacing specified in ASTM C1127. Do not install top coat over tile.

3.14 GROUTING

- A. Grout Type and Location:

1. Grout for tile to be urethane grout.

B. Workmanship:

1. Install and cure grout in accordance with the applicable standard.
2. Urethane Grout: ANSI A108.1.

3.15 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.

3.16 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.

3.17 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.

- - - E N D - - -

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1- GENERAL

1.1 DESCRIPTION

- A. Metal ceiling suspension system for acoustical ceilings.
- B. Acoustical units.
- C. Adhesive application.

1.2 RELATED WORK

- A. Color, pattern, and location of each type of acoustical unit:
 - 1. Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTAL

- 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
 - 2. Acoustical units, each type
- D. Manufacturer's Certificates: Acoustical units, each type, in accordance with specification requirements.
- E. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
 - 2. Product data for Credit IEQ 4.1: For sealants, including printed statement of VOC content.

1.4 DEFINITIONS

- A. Standard definitions as defined in ASTM C634.
- B. Terminology as defined in ASTM E1264.

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):

A641/A641M-03.....Zinc-coated (Galvanized) Carbon Steel Wire
A653/A653M-07.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-
Iron Alloy-coated (Galvannealed) by the Hot-Dip
Process
C423-07.....Sound Absorption and Sound Absorption
Coefficients by the Reverberation Room Method
C634-02 (E2007).....Standard Terminology Relating to Environmental
Acoustics
C635-04.....Metal Suspension Systems for Acoustical Tile and
Lay-in Panel Ceilings

E84-07.....Surface Burning Characteristics of Building
Materials
E119-07.....Fire Tests of Building Construction and
Materials
E413-04.....Classification for Rating Sound Insulation.
E580-06.....Application of Ceiling Suspension Systems for
Acoustical Tile and Lay-in Panels in Areas
Requiring Seismic Restraint
E1264-(R2005).....Classification for Acoustical Ceiling Products

PART 2- PRODUCTS

2.1 METAL SUSPENSION SYSTEM

- A. ASTM C635, heavy-duty system, except as otherwise specified.
 - 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.
 - 3. Use aluminum suspension in kitchens and aluminum or fire resistant plastic in toilets adjacent to shower areas, hydrotherapy, and swimming pools.
- B. Exposed grid suspension system for support of lay-in 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 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.
- C. Suspension system for support of Metal Type V, VI, and VII tiles:
Concealed grid type having runners designed for the snap-in attachment of metal tile (pans).
- D. Recycled Content:
1. Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer content is not less than 25 percent.

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. Hanger Inserts:
 1. Fabricate inserts from steel, zinc-coated (galvanized after fabrication).
 2. Nailing type option for wood forms:
 - a. Upper portion designed for anchorage in concrete and positioning lower portion below surface of concrete approximately 25 mm (one inch).
 - b. Lower portion provided with not less than 8 mm (5/16 inch) hole to permit attachment of hangers.
 3. Flush ceiling insert type:
 - a. Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.

- b. Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
 - c. Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.
- C. 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.
- D. Tile Splines: ASTM C635.

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		Hot-rolled	
		Kg	Pound	Kg	Pound
38	1 1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

2.6 ADHESIVE

- A. ASTM D1779, having flame spread index of 25 or less when tested in accordance with ASTM E84.
- B. Developing minimum strength of 7 kg/m² (one psi) of contact surface 48 hours after installation in temperature of 21 °C (70 °F).

2.7 ACOUSTICAL UNITS

- A. General:
 - 1. Ceiling Tile shall meet minimum 37% 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, with square edges.
- B. Type III Units - Mineral base with water-based painted finish less than 10 g/l VOC, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Mineral base to contain minimum 65 percent recycled content.
- C. 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.
- D. Recycled Content:
 1. Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer content is not less than 20 percent.

2.8 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

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.

E. Existing Ceiling:

1. Where extension of existing ceilings occur, match existing.
2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units within a space which results in contrast between old and new acoustic units.
3. Comply with specifications for new acoustical units for new units required to match appearance of existing units.

3.2 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:

- a. 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. Indirect Hung Suspension System:

1. As illustrated in ASTM C635.
2. Space carrying channels for indirect hung suspension system not more than 1200 mm (4 feet) on center. Space hangers for carrying channels not more than 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) on center so as to insure that specified requirements are not exceeded.

3. Support main runners by specially designed clips attached to carrying channels.

E. 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 of suspended ceiling at bottom.

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.
- C. Adhesive applied tile:
 1. Condition of surface shall be in accordance with ASTM D1779, Note 1, Cleanliness of Surface, and Note 4, Rigidity of Base Surface.
 2. Size or seal surface as recommended by manufacturer of adhesive and allow to dry before installing units.
- D. 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.

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**SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the installation of vinyl or rubber base.

1.2 RELATED WORK

- A. Color and texture: Section 09 06 00, SCHEDULE FOR FINISHESS.
B. Integral base with sheet flooring: Section 09 65 16, RESILIENT SHEET FLOORING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
1. Description of each product.
2. Base and stair material manufacturer's recommendations for adhesives.
3. Application and installation instructions.
C. Samples:
1. Base: 150 mm (6 inches) long, each type and color.
2. Adhesive: Literature indicating each type.
D. LEED Submittals:
1. Product data for Credit IEQ 4.1: For adhesives, including printed statement of VOC content.

1.4 DELIVERY

- A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
B. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

1.5 STORAGE

- A. Store materials in weather tight and dry storage facility.
B. Protect material from damage by handling and construction operations before, during, and after installation.

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):
F1861-08.....Resilient Wall Base

PART 2 - PRODUCTS

2.1 GENERAL

Use only products by the same manufacturer and from the same production run.

2.2 RESILIENT BASE

- A. ASTM F1861, 3 mm (1/8 inch) thick, 100 mm (6 inches) high, Thermoplastics, Group 2-layered. Style B-cove.
- B. Where carpet occurs, use Style A-straight.
- C. Use only one type of base throughout.

2.3 PRIMER (FOR CONCRETE FLOORS)

As recommended by the adhesive and tile manufacturer.

2.4 LEVELING COMPOUND (FOR CONCRETE FLOORS)

Provide products with latex or polyvinyl acetate resins in the mix.

2.5 ADHESIVES

- A. Use products recommended by the material manufacturer for the conditions of use.
- B. Use low-VOC adhesive during installation complying with Low Emitting Materials, LEED IEQ 4.1. Water based adhesive with low VOC is preferred over solvent based adhesive. See Section 01 81 13.16 SUSTAINABLE DESIGN REQUIREMENTS FOR COMMERCIAL INTERIORS.

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 Resident Engineer.
- B. Submit proposed installation deviation from this specification to the Resident Engineer indicating the differences in the method of installation.

- C. The Resident Engineer reserves the right to have test portions of material installation removed to check for non-uniform adhesion and spotty adhesive coverage.

3.3 PREPARATION

- A. Examine surfaces on which material is to be installed.
- B. Fill cracks, pits, and dents with leveling compound.
- C. Level to 3 mm (1/8 inch) maximum variations.
- D. Do not use adhesive for leveling or filling.
- E. 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 CLEANING AND PROTECTION

- A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets.

- B. Keep traffic off resilient material for at least 72 hours after installation.
- C. Clean and polish materials in the following order:
 - 1. After two weeks, scrub resilient base, sheet rubber and treads materials with a minimum amount of water and a mild detergent. Leave surfaces clean and free of detergent residue. Polish resilient base to a gloss finish.
 - 2. Do not polish tread and sheet rubber materials.
- D. When construction traffic is anticipated, cover tread materials with reinforced kraft paper and plywood or hardboard properly secured and maintained until removal is directed by the Resident Engineer.
- E. Where protective materials are removed and immediately prior to acceptance, replace damaged materials and re-clean resilient materials. Damaged materials are defined as having cuts, gouges, scrapes or tears and not fully adhered.

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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 wearlayer 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. Concrete floors: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Color, pattern and texture: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Resilient base over base of lockers, equipment and casework: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- D. Unbacked vinyl (homogenous) sheet flooring with welded seams: Section 09 65 16, RESILIENT SHEET FLOORING.

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 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 300 mm (12 inches) square for each type, pattern and color.
 - 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.
- D. LEED Submittals:
 - 1. Product data for Credit IEQ 4.1: For adhesives and chemical-bonding compounds, including printed statement of VOC content.
 - 2. Product data for Credit IEQ 4.3: For documentation indicating compliance with testing and product requirements of the "Floor Score Program" by RFCI.

1.5 PROJECT CONDITIONS

- A. Maintain temperature of floor materials and room, where work occurs, above 18 ° C (65 °F) and below 38 ° C (100 °F) for 48 hours before, during and for 48 hours after installation. After above period, room temperature shall not fall below 13 ° C (55 °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.

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):
 - E648-10.....Critical Radiant Flux of Floor-Covering Systems
Using a Radiant Energy Source.
 - E662-12.....Specific Optical Density of Smoke Generated by
Solid Materials.
 - F710-08.....Practice for Preparing Concrete Floors and Other
Monolithic Floors to Receive Resilient Flooring.
 - F1303-04(2009).....Sheet Vinyl Floor Covering with Backing.
 - F1869-10.....Moisture Vapor Emission Rate of Concrete
Subfloor using Anhydrous Calcium Chloride
 - F1913-04(2010).....Sheet Vinyl Flooring without Backing
 - F2170-09.....Determining Relative Humidity in Concrete Floor
Slabs using In-situ Probes
- C. Resilient Floor Covering Institute (RFCI):
 - 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.

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 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.
- B. Size: Provide maximum size sheet vinyl material produced by manufacturer to provide minimum number of joints. Minimum size width acceptable - 1200 mm (48 inches).
- C. Each color and pattern of sheet flooring shall be of same production run.

2.2 WELDING ROD:

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. Mastic Underlayment (for concrete floors): Provide products with latex or polyvinyl acetate resins in mix. Condition to be corrected shall determine type of underlayment selected for use.
- C. 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 (6 ft) 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.

2.5 ADHESIVES

- A. Water resistant type recommended by the sheet flooring manufacturer for the conditions of use. VOC not to exceed 50g/L and to meet Low Emitting Materials, LEED IEQ 4.1. See Section 01 81 13.16 SUSTAINABLE DESIGN REQUIREMENTS FOR COMMERCIAL INTERIORS.

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 °C (65 °F), for 48 hours before installation.
- B. Maintain temperature of rooms where sheet flooring work occurs above 36 °C (65 °F), for 48 hours, before installation and during installation.
- C. After installation, maintain temperature at or above 36 °C (65 °F.)
- D. Building is permanently enclosed.

- E. Wet construction in or near areas to receive sheet flooring is complete, dry and cured.

3.2 SUBFLOOR PREPARATION

- A. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710.
 - 1. Installer shall examine surfaces on which resilient sheet flooring is to be installed, and shall advise Contractor, in writing, of areas which are unacceptable for installation of flooring material. Installer shall advise Contractor which methods are to be used to correct conditions that will impair proper installation. Installation shall not proceed until unsatisfactory conditions have been corrected.
 - 2. Slab substrates dry, free of curing compounds, sealers, hardeners, and other materials which would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by Resilient Floor Covering Institute recommendations in manual RFCI-MRP.
- B. Broom or vacuum clean substrates to be covered by sheet vinyl floor coverings immediately before installation. Following cleaning, examine substrates to determine if there is visually any evidence of moisture, alkaline salts, carbonation, or dust.
- C. Primer: If recommended by flooring manufacturer, prior to application of adhesive, apply concrete slab primer in accordance with manufacturer's directions.
- D. Correct conditions which will impair proper installation, including trowel marks, pits, dents, protrusions, cracks or joints.
- E. Fill cracks, joints, depressions, and other irregularities in concrete with leveling compound.
 - 1. Do not use adhesive for filling or leveling purposes.
 - 2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
 - 3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joint lines.
- F. Clean floor of oil, paint, dust and deleterious substances. Leave floor dry and cured free of residue from existing curing or cleaning agents.
- G. Moisture Testing: Perform moisture and pH test as recommended by the flooring and adhesive manufacturers. Perform test locations starting on the deepest part of the concrete structure. Proceed with installation only after concrete substrates meet or exceed the manufacturer's requirements. In the absence of specific guidance from the flooring or adhesive manufacturer the following requirements are to be met:

1. Perform moisture vapor emission tests in accordance with ASTM F1869. Proceed with installation only after substrates have a maximum moisture-vapor-emission rate of 1.36 kg of water/92.9 sq. m (3lb of water/1000 sq. ft.) in 24 hours.
 2. Perform concrete internal relative humidity testing using situ probes in accordance with ASTM F2170. Proceed with installation only after concrete reaches maximum 75 percent relative humidity level measurement.
- H. Preparation shall include the removal of existing resilient floor and existing adhesive. Do not use solvents to remove adhesives.
- 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 Resident Engineer 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.

- 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 COVED BASE

- A. Set preformed cove to receive base. Install base material with adhesive and terminate exposed edge with cap strip. Integral base shall be 150 mm (6 inches) high.
- B. Internal and external corners shall be formed to geometric shape generated by cove at either square or radius corners.

3.5 WELDING

- A. Heat weld all joints of flooring and base using equipment and procedures recommended by flooring manufacturer.
- B. Welding shall consist of routing joint, inserting a welding rod into routed space, and terminally fusing into a homogeneous joint.
- C. Upon completion of welding, surface across joint shall finish flush, free from voids, and recessed or raised areas.
- D. Fusion of Material: Joint shall be fused a minimum of 65 percent through thickness of material, and after welding shall meet specified characteristics for flooring.

3.6 CLEANING

- A. Clean small adhesive marks during application of sheet flooring and base before adhesive sets, excessive adhesive smearing will not be accepted.

- B. Remove visible adhesive and other surface blemishes using methods and cleaner recommended by floor covering manufacturers.
- C. Clean and polish materials per flooring manufacturer's written recommendations.
- D. Vacuum floor thoroughly.
- E. Do not wash floor until after period recommended by floor covering manufacturer and then prepare in accordance with manufacturer's recommendations.
- F. Upon completion, Resident Engineer 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 Resident Engineer.
- D. Where protective materials are removed and immediately prior to acceptance, repair any damage, re-clean sheet flooring, lightly re-apply polish and buff floor.

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SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the installation of solid vinyl tile flooring, and accessories.

1.2 RELATED WORK

- A. Color and pattern and location in room finish schedule: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Resilient material manufacturers recommendations for adhesives, underlayment, primers and polish.
 - 3. Application and installation instructions.
- C. Samples:
 - 1. Tile: 300 mm by 300 mm (12 inches by 12 inches) for each type, pattern and color.
 - 2. Edge Strips: 150 mm (6 inches) long, each type.
 - 3. Feature Strips: 150 mm (6 inches) long.
- D. Shop Drawings:
 - 1. Layout of patterns shown on the drawings and in Section 09 06 00, SCHEDULE FOR FINISHES.
 - 2. Edge strip locations showing types and detail cross sections.
- E. Test Reports:
 - 1. Abrasion resistance: Depth of wear for each tile type and color and volume loss of tile, certified by independent laboratory.
 - 2. Tested per ASTM F510.
- F. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycle content. Include statement indicating costs for each product having recycled content.
 - 2. Product data for Credit IEQ 4.1: For adhesives, including printed statement of VOC content.

3. Product data for Credit IEQ 4.3: For documentation indicating compliance with testing and product requirements of the "Floor Score Program" by RFCI.

1.4 DELIVERY

- A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
- B. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

1.5 STORAGE

- A. Store materials in weathertight and dry storage facility.
- B. Protect from damage from handling, water, and temperature.

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):
 - D4078-02 (2008).....Water Emulsion Floor Finish
 - E648-10.....Critical Radiant Flux of Floor Covering Systems
Using a Radiant Energy Source
 - E662-09.....Specific Optical Density of Smoke Generated by
Solid Materials
 - E1155-96 (R2008).....Determining Floor Flatness and Floor Levelness
Numbers
 - F510-93 (R 2008).....Resistance to Abrasion of Resilient Floor
Coverings Using an Abrader with a Grit Feed
Method
 - F710-08.....Preparing Concrete Floors to Receive Resilient
Flooring
 - F1700-04 (R2010).....Solid Vinyl Floor Tile
- C. Federal Specifications (Fed. Spec.):
 - SS-T-312.....Tile Floor: Asphalt, Rubber, Vinyl and Vinyl
Composition

1.7 EXTRA MATERIALS

- A. Furnish full size units equal to 2 percent of quantity of resilient flooring installed as extra material. Properly label and package extra materials and deliver to Owner's storage area.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Furnish product type, materials of the same production run and meeting following criteria.
- B. Use adhesives, underlayment, primers and polish recommended by the floor resilient material manufacturer.
- C. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E 648.
- D. Smoke density: Less than 450 per ASTM E662.
- E. Recycle content 30% min. preconsumer.

2.2 SOLID VINYL-TILE

- A. ASTM F1700, 300 mm (12 by 12 inches) square, 3 mm (1/8 inch) thick, homogenous throughout.
- B. Color and Pattern uniformly distributed throughout thickness.
- C. Where solid vinyl tiles are specified, seek products with recycled content.

2.3 ADHESIVES

- A. Comply with applicable regulations regarding toxic and hazardous materials Green Seal (GS-36) for commercial adhesive.
- B. Use low-VOC adhesive during installation. Water based is preferred over solvent based adhesives.

2.4 PRIMER (FOR CONCRETE SUBFLOORS)

- A. As recommended by the adhesive and tile manufacturer.

2.5 LEVELING COMPOUND (FOR CONCRETE FLOORS)

- A. Provide cementitious products with latex or polyvinyl acetate resins in the mix.
- B. Determine the type of underlayment selected for use by the condition to be corrected.

2.6 POLISH AND CLEANERS

- A. Cleaners RFCI CL-1.
- B. Polish: ASTM D4078.

2.7 EDGE STRIPS

- A. 28 mm (1-1/8 inch) wide unless shown otherwise.
- B. Bevel from maximum thickness to minimum thickness for flush joint unless shown otherwise.
- C. Extruded aluminum, mill finish, mechanically cleaned:
 - 1. Drill and counter sink edge strip for flat head screws.

2. Space holes near ends and approximately 225 mm (9 inches) on center between.

- D. Resilient Edge Strip or Reducer Strip: Fed. Specs. SS-T-312, Solid vinyl.

2.8 SCREWS

- A. Stainless steel flat head screw.

2.9 FEATURE STRIPS

- A. Use same material as floor tile.
- B. Sizes and shapes as shown.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

- A. Maintain temperature of materials a minimum of 22 °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 flooring until building is permanently enclosed and wet construction in or near areas to receive tile materials is complete, dry and cured.

3.2 SUBFLOOR PREPARATION

- A. Verify that concrete slabs comply with ASTM F710. At existing slabs, determine levelness by F-number method in accordance with ASTM E1155. Overall value shall not exceed as follows:
 1. FF30/FL20
- B. Correct conditions which will impair proper installation.
- C. Fill cracks, joints 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 joints.
- D. Clean floor of oil, paint, dust, and deleterious substances: Leave floor dry and cured free of residue from existing curing or cleaning agents.
- E. Concrete Subfloor Testing:
 1. Determine Adhesion and dryness of the floor by bond and moisture tests as recommended by RFCI manual MRP.

- F. Perform additional subfloor preparation to obtain satisfactory adherence of flooring if subfloor test patches allows easy removal of tile.
- G. Prime the concrete subfloor if the primer will seal slab conditions that would inhibit bonding, or if priming is recommended by the tile or adhesive manufacturers.
- H. Preparation of existing installation shall include the removal of existing resilient floor and existing adhesive. Do not use solvents to remove adhesives.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions for application and installation unless specified otherwise.
- B. Mix tile from at least two containers. An apparent line either of shades or pattern variance will not be accepted.
- C. Tile Layout:
 - 1. If layout is not shown on drawings, lay tile symmetrically about center of room or space with joints aligned.
 - 2. No tile shall be less than 150 mm (6 inches) and of equal width at walls.
 - 3. Place tile pattern in the same direction; do not alternate tiles.
- D. Trim tiles to touch for the length of intersections at pipes and vertical projections, seal joints at pipes with waterproof cement.
- E. Application:
 - 1. Apply adhesive uniformly with no bare spots.
 - a. Conform to RFC1-TM-6 for joint tightness and for corner intersection unless layout pattern shows random corner intersection.
 - b. More than 5 percent of the joints not touching will not be accepted.
 - 2. Roll tile floor with a minimum 45 kg (100 pound) roller. No exceptions.
 - 3. The Resident Engineer may have test tiles removed to check for non-uniform adhesion, spotty adhesive coverage, and ease of removal. Install new tile for broken removed tile.
- F. Installation of Edge Strips:
 - 1. Locate edge strips under center line of doors unless otherwise shown.
 - 2. Set resilient edge strips in adhesive. Anchor metal edge strips with anchors and screws specified.
 - 3. Where tile edge is exposed, butt edge strip to touch along tile edge.
 - 4. Where thin set ceramic tile abuts resilient tile, set edge strip against floor file and against the ceramic tile edge.

3.4 CLEANING AND PROTECTION

- A. Clean adhesive marks on exposed surfaces during the application of resilient materials before the adhesive sets. Exposed adhesive is not acceptable.
- B. Keep traffic off resilient material for a minimum 72 hours after installation.
- C. Clean and polish materials in the following order:
 - 1. For the first two weeks sweep and damp mopped only.
 - 2. After two weeks, scrub resilient materials with a minimum amount of water and a mild detergent. Leave surface clean and free of detergent residue.
 - 3. Apply polish to the floors in accordance with the polish manufacturer's instructions.
- D. When construction traffic occurs over tile, cover resilient materials with reinforced kraft paper properly secured and maintained until removal is directed by Resident Engineer. At entrances and where wheeled vehicles or carts are used, cover tile with plywood, hardboard, or particle board over paper, secured and maintained until removal is directed by Resident Engineer.
- E. When protective materials are removed and immediately prior to acceptance, replace any damage tile, re-clean resilient materials, lightly re-apply polish and buff floors.

3.5 LOCATION

- A. Unless otherwise specified or shown, install tile flooring, on floor under areas where casework, laboratory and pharmacy furniture and other equipment occurs, except where mounted in wall recesses.
- B. Extend tile flooring for room into adjacent closets and alcoves.

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SECTION 09 67 23.20
RESINOUS (EPOXY BASE) WITH VINYL CHIP BROADCAST (RES-2)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies Resinous (Resinous epoxy base with vinyl chip flake broadcast) flooring with integral cove base
 - 1. Res-2 Resinous (epoxy) vinyl chip flake broadcast flooring system.

1.2 RELATED WORK

- A. Concrete and Moisture Vapor Barrier: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Color and location of each type of resinous flooring: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Description of each product to be provided.
 - 2. Application and installation instructions.
 - 3. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.
- C. Qualification Data: For Installer.
- D. Sustainable Submittal:
 - 1. Product data for products having recycled content, submit documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
 - a. Include statements indicating costs for each product having recycled content.
 - 2. Product data for field applied, interior, paints, coatings, and primers, include printed statement of VOC content indicating compliance with environmental requirements.
- E. Samples:
 - 1. Each color and texture specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 - 2. Samples for verification: For each (color and texture) resinous flooring system required, 6 inches (152 mm) square, applied to a rigid backing by installer for this project.
 - 3. Sample showing construction from substrate to finish surface in thickness specified and color and texture of finished surfaces.

Finished flooring must match the approved samples in color and texture.

- F. Shop Drawings: Include plans, sections, component details, and attachment to other trades. Indicate layout of the following:
 - 1. Patterns.
 - 2. Edge configuration.
- G. Certifications and Approvals:
 - 1. Manufacturer's certification of material and substrate compliance with specification.
 - 2. Manufacturer's approval of installer.
 - 3. Contractor's certificate of compliance with Quality Assurance requirements.
- H. Warranty: As specified in this section.

1.4 QUALITY ASSURANCE

- A. Manufacture Certificate: Manufacture shall certify that a particular resinous flooring system has been manufactured and in use for a minimum of five (5) years.
- B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this project for a minimum period of five (5) years, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
 - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
 - 2. Contractor shall have completed at least ten (10) projects of similar size and complexity. Include list of at least five (5) projects. List must include owner (purchaser); address of installation, contact information at installation project site; and date of installation.
 - 3. Installer's Personnel: Employ persons trained for application of specified product.
- C. Source Limitations:
 - 1. Obtain primary resinous flooring materials including primers, resins, hardening agents, grouting coats and finish or sealing coats from a single manufacturer.
 - 2. Provide secondary materials, including patching and fill material, joint sealant, and repair material of type and from source recommended by manufacturer of primary materials.

- D. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and establish quality standards for materials and execution.
1. Apply full-thickness mockups on 48 inch (1200 mm)square floor area selected by VA Resident Engineer.
 - a. If applicable include 48 inch (1200 mm)length of integral cove base.
 2. Approved mockups not damaged during the testing may become part of the completed work if undisturbed at time of Substantial Completion.
 3. Sign off from VA Resident Engineer on texture for slip resistance and clean ability must be complete before installation of flooring system.
- E. Pre-Installation Conference:
1. Convene a meeting not less than thirty days prior to starting work.
 2. Attendance:
 - a. Contractor
 - b. VA Resident Engineer
 - c. Manufacturer and Installer's Representative
 3. Review the following:
 - a. Environmental requirements
 - 1) Air and surface temperature
 - 2) Relative humidity
 - 3) Ventilation
 - 4) Dust and contaminates
 - b. Protection of surfaces not scheduled to be coated
 - c. Inspect and discuss condition of substrate and other preparatory work performed
 - d. Review and verify availability of material; installer's personnel, equipment needed
 - e. Design, patterns and edge conditions.
 - f. Performance of the coating with chemicals anticipated in the area receiving the resinous (urethane and epoxy mortar/cement) flooring system
 - g. Application and repair
 - h. Field quality control
 - i. Cleaning
 - j. Protection of coating systems
 - k. One-year inspection and maintenance
 - l. Coordination with other work

- F. Manufacturer's Field Services: Manufacturer's representative shall provide on-site technical assistance and guidance for surface preparation and application of resinous flooring systems.
- G. Contractor Job Site Log: Contractor shall document daily; the work accomplished environmental conditions and any other condition event significant to the long term performance of the urethane and epoxy mortar/cement flooring materials installation. The Contractor shall maintain these records for one year after Substantial Completion.

1.5 MATERIAL PACKAGING DELIVERY AND STORAGE

- A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
- B. Protect materials from damage and contamination in storage or delivery, including moisture, heat, cold, direct sunlight, etc.
- C. Maintain temperature of storage area between 60 and 80 degrees F (15 and 26 degrees C).
- D. Keep containers sealed until ready for use.
- E. Do not use materials beyond manufacturer's shelf life limits.
- F. Package materials in factory pre-weighed and in single, easy to manage batches sized for ease of handling and mixing proportions from entire package or packages. No On site weighing or volumetric measurements are allowed.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring applications.
 - 1. Maintain material and substrate temperature between 65 and 85 degrees F (18 and 30 degrees C) during resinous flooring application and for not less than 24 hours after application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.
- D. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade.

Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

1.7 WARRANTY

- A. Work subject to the terms of the Article "Warranty of Construction" FAR clause 52.246-21.
- B. Warranty: Manufacture shall furnish a single, written warranty covering the full assembly (including substrata) for both material and workmanship for a extended period of three (3) full years from date of installation, or provide a joint and several warranty signed on a single document by manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of three (3) full years from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

1.8 APPLICABLE PUBLICATIONS

- A. The publication listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ACI (American Concrete Institute):
Comm. 503.1-92.....Four Epoxy Specifications (Reapproved 2003).
- C. American Society for Testing and Materials (ASTM):
C109.....Standard Test Method for Compressive Strength of
Hydraulic Cement Mortars (Using 2" or 50 mm Cube
Specimens)
C150.....Standard Specification for Portland Cement
C219-07a.....Standard Terminology Relating to Hydraulic
Cement
C267-01(2006).....Standard Test Methods for Chemical Resistance of
Mortars, Grouts, and Monolithic Surfacing and
Polymer Concretes
C307-03 (2008).....Standard Test Method for Tensile Strength of
Chemical-Resistant Mortar, Grouts, and
Monolithic Surfacing
C413-01(2006).....Standard Test Method for Absorption of Chemical-
Resistant Mortars, Grouts, Monolithic Surfacing
and Polymer Concretes
C501-84(2002).....Standard Test Method for Relative Resistance to
Wear of Unglazed Ceramic Tile by the Taber
Abraser

- C579-01(2006).....Standard Test Method for Compressive Strength of
Chemical-Resistant Mortars, Grouts, Monolithic
Surfacings, and Polymer Concretes
- C580-02(2008).....Standard Test Method for Flexural Strength and
Modulus of Elasticity of Chemical-Resistant
Mortars, Grouts, Monolithic Surfacings, and
Polymer Concretes
- C722-04.....Standard Specification for Chemical-Resistant
Monolithic Floor Surfacings
- C811-98(2008).....Standard Practice for Surface Preparation of
Concrete for Application of Chemical-Resistant
Resin Monolithic Surfacings
- C881/C881M-02.....Standard Specification for Epoxy-Resin-Base
Bonding Systems for Concrete
- D1308-02(2007).....Standard Test Method for Effect of Household
Chemicals on Clear and Pigmented Organic
Finishes
- D1652-04.....Standard Test Method for Epoxy Content of Epoxy
Resins
- D2240-05.....Standard Test Method for Rubber Property –
Durometer Hardness
- D4060-07.....Standard Test Method for Abrasion Resistance of
Organic Coatings by the Taber Abraser
- E162-09.....Standard Test Method for Surface Flammability of
Using a Radiant Heat Energy Source
- E648-09a.....Standard Test Method for Critical Radiant Flux
of Floor- Covering Systems Using a Radiant Heat
Energy Source
- F1869-09.....Standard Test Method for Measuring Moisture
Vapor Emission Rate of Concrete Subfloor Using
Anhydrous Calcium Chloride
- D. Military Specification (Mil Spec):
 - MIL-PRF-3134.....Para. 4.7.3, Indentation, No Cracking or Loss of
Bond Water Absorption
 - MIL-PRF-23003A.....Para. 4.6.11, Resistance to Immersion
- E. National Association of Architectural Metal Manufacturers (NAAMM):
 - AMP 501.....Finishes for Aluminum
- F. National Fire Protection Association (NFPA):
 - 56A.....Inhalation Aesthetics replaced by NFPA 99
Standard for Health Care Facilities

- G. The Society For Protective Coatings (SSPC):
SP6.....Commercial Blast Cleaning

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION FOR RES-2 (BROADCAST VINYL CHIP FLAKE)

- A. System Descriptions:
1. Monolithic, multi-component epoxy chemistry resinous flooring system.
Primer and troweled mortar base with broadcast quartz aggregates,
High performance multi-component solvent free epoxy undercoat, Vinyl
chip flake broadcast media in desired flake size (1/8", 1/4"). High
performance multi component epoxy and solvent free sealers.
- B. Products: Subject to compliance with applicable fire, health,
environmental, and safety requirements for storage, handling,
installation, and clean up.
- C. System Components: Verify specific requirements as systems vary by
manufacturer. Verify build up layers of broadcast and installation
method. Verify compatibility with substrate. Use manufacturer's
standard components, compatible with each other and as follows:
1. Primer (primer coat):
 - a. Resin: epoxy.
 - b. Formulation Description: Two-component, high solids.
 - c. Application Method: squeegee, back roll.
 - d. Thickness of coat(s): 2-3mil.
 - e. Number of Coats: One.
 2. Mortar Base: (trowel applied mortar)
 - a. Resin: Epoxy
 - b. Formulation Description: Four-component mortar consisting of
epoxy-resin, curing agent, selected, graded aggregates and
inorganic pigments.
 - c. Application Method: Steel Trowel
 - d. Thickness: 1/8" minimum
 - e. Number of applications: 1
 3. Undercoat with Broadcast Flakes: (broadcast coat)
 - a. Resin: Epoxy.
 - b. Formulation Description: Pigmented multi-component, high solids.
 - c. Application Method: Notched squeegee and Back roll
 - d. Number of Coats: One.
 - e. Aggregates: vinyl chip flake broadcast into wet Undercoat.
 - f. Thickness of coat(s): 20-30mil.

- g. Number of Coats: One.
- 4. Sealer coat:
 - a. Resin: Epoxy.
 - b. Formulation Description: Multiple component high solids, no solvent UV stable.
 - c. Type/Finsh: Clear Gloss.
 - d. Thickness of coat(s): 2-3mil.
 - e. Number of Coats: (2) two.
 - f. Application: Squeegee and finish roll.
- D. Physical Properties:

1. Physical

Property	Test	Value
Compressive Strength (Epoxy Mortar)	ASTM C579	10,000 psi
Tensile Strength (Undercoat/Broadcast/Sealer)	ASTM D638	5,200 psi
Tensile Strength (Epoxy Mortar)	ASTM C307	1,750 psi
Volatile Organic Compound Limits (V.O.C.)	EPA & LEED	Below 100 g/l
Flexural Strength	ASTM D790	4,000 psi
Water Absorption	ASTM C413	0.056%
Coefficient of friction dry/slip index wet	ASTM D2047	>.79 dry >.65 wet
Impact Resistance	ASTM D4226	> 160 in. lbs
Abrasion Resistance	ASTM D4060 CS-17	0.03 gm maximum weight loss
Thermal Coefficient of Linear Expansion	ASTM C531	17 x 10 ⁻⁶ in/in °F
Hardness Shore D	ASTM D2240	85 to 90
Bond Strength	ASTM D7234	>300 psi 100% concrete failure. Note: Tensile strength of concrete must be at least 300 psi)
Chemical Resistance of the following:	ASTM D1380	No Effect
Acetic acid	5 percent	
Ammonium hydroxide	10 percent	
Citric Acid	50 percent	
Fatty acid Motor Oil, 20W		
Hydrochloric acid	10 percent	
Salt water		
Sodium Hydroxide	10 percent	
Sulfuric acid	10 percent	
Trisodium phosphate	5 percent	
Urine		
Feces		
Hydrogen peroxide	28 percent	
Distilled Water		
Sodium Hypochloride	5.28 percent	

RESINOUS (EPOXY BASE) WITH
VINYL CHIP BROADCAST (RES-2)

E. System Characteristics:

1. Color and Pattern: per 09 06 00 Schedule for Finishes
2. Integral cove base: 1 inch (25.4 mm) radius epoxy mortar cove keyed into concrete substrate and or resinous flooring mortar system. No fillers integral cove base must be troweled in place with specified resinous mortar base.
3. Overall System Thickness: Nominal 3/16 to 1/4 inches (4.76 to 6.35 mm).
4. Finish: Standard.
5. Temperature Range: Systems vary by manufacturer; approximate range from a minimum of 45 to 150 degrees F.

F. Physical Properties:

1. Physical Properties of flooring system when tested as follows:

2.2 SUPPLEMENTAL MATERIALS

- A. Textured Top Coat: Type recommended or produced by manufacturer of seamless resinous flooring system for desired final finish.
- B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service or joint conditioned indicated.
- C. Waterproof Membrane: Type recommended or produced by manufacturer of resinous floor coatings for type of service and conditions as indicated in Drawings.

2.3 TROWELED COVE BASE //AND TRENCH LINER//

- A. Same physical properties as specified resinous mortar system.

2.4 BASE CAP STRIP

- A. Aluminum, Extruded: ASTM B221, Alloy 6063-T6. Or Zinc.
- B. Shape for 1/8 inch (3.17 mm) depth of base material, "J" configuration.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where monolithic resinous system with integral base is to be installed with the VA Resident Engineer.
- B. Moisture Vapor Emission Testing: Perform moisture vapor transmission testing in accordance with ASTM F1869 to determine the MVER of the substrate prior to commencement of the work. See section 3.4, 3.

3.2 PROJECT CONDITIONS

- A. Maintain temperature of rooms (air and surface) where work occurs, between 70 and 90 degrees F (21 and 32 degrees C) for at least 48 hours, before, during, and 24 hours after installation. Maintain temperature at least 70 degrees F (21 degrees C) during cure period.
- B. Maintain relative humidity less than 75 percent.
- C. Do not install materials until building is permanently enclosed and wet construction is complete, dry, and cured.
- D. Maintain proper ventilation of the area during application and curing time period.
 - 1. Comply with infection control measures of the VA Medical Center.

3.3 INSTALLATION REQUIREMENTS

- A. The manufacturer's instructions for application and installation shall be reviewed with the VA Resident Engineer for the seamless resinous (urethane and epoxy mortar) flooring system with integral cove base
- B. Substrate shall be approved by manufacture technical representative.

3.4 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Prepare concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

3. Verify that concrete substrates are dry.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of [**3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)**] in 24 hours.
 - b. MVT threshold for monolithic resinous flooring shall not exceed 3 lbs/1000 square feet (0.0001437 kPa) in a 24 hour period.
 - c. When MVT emission exceeds this limit, apply manufacturer's recommended vapor control primer or other corrective measures as recommended by manufacturer prior to application of flooring or membrane systems.
 - d. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 75-80 percent.
 - e. Provide a written report showing test placement and results.
4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for flooring manufacturer recommended joint fill material, and concrete crack treatment.
- F. Prepare wall to receive integral cove base
 1. Verify wall material is acceptable for resinous flooring application, if not, install material (e.g. cement board) to receive base.
 2. Fill voids in wall surface to receive base, install undercoats (e.g. water proofing membrane, and/or crack isolation membrane) as recommended by resinous flooring manufacturer.
 3. Install base prior to flooring if required by resinous flooring manufacturer.
 4. Grind, cut or sand protrusions to receive base application.

3.5 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Apply Primer: over prepared substrate at manufacturer's recommended spreading rate for all areas to receive integrated cove base.
- C. Apply cove base: Trowel to wall surfaces at a 1 inch radius, before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, and troweling, sanding, and top coating of cove base. Round internal and external corners.
- D. Apply Primer: over prepared substrate at manufacturer's recommended spreading rate.
- E. Trowel mortar base: Mix mortar material according to manufacturer's recommended procedures. Climatic and non-climatic resinous flooring systems may vary slightly on mode of application. Application should be based upon the following: Uniformly spread mortar over substrate using a specially designed screed box adjusted to manufacturer's recommended height. Metal trowel (hand or power) single mortar coat in thickness indicated for flooring system, grout to fill substrate voids. When cured, sand to remove trowel marks and roughness.
- F. Under Coat: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed substrate using manufacturer's installation tool. Roll material with strict adherence to manufacturer's installation procedures and coverage rates.

- G. Broadcast: Immediately broadcast vinyl flakes into the body coat. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
- H. First Sealer: Remove excess un-bonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.
- I. Second Sealer: Lightly sand first sealer coat. Mix and apply second sealer coat with strict adherence to manufacturer's installation procedures.

3.6 TOLERANCE

- A. From line of plane: Maximum 1/8 inch (3.18 mm) in total distance of flooring and base. Broadcast resinous flooring system will contour substrate. Deviation and tolerance are subject to concrete tolerance.
- B. From radius of cove: Maximum of 1/8 inch (3.18 mm) plus or 1/16-inch (1.59 mm) minus.

3.7 CURING, PROTECTION AND CLEANING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process.
- B. Close area of application for a minimum of 24 hours.
- C. Protect resinous flooring materials from damage and wear during construction operation.
 - 1. Cover flooring with kraft type paper.
 - 2. Optional 6 mm (1/4 inch) thick hardboard, plywood, or particle board where area is in foot or vehicle traffic pattern, rolling or fixed scaffolding and overhead work occurs.
- D. Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

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SECTION 09 68 00
CARPETING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section specifies carpet, edge strips, adhesives, and other items required for complete installation.

1.2 RELATED WORK

- A. Color and texture of carpet and edge strip: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. 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.
- C. Low VOC Compliance:
 - 1. Carpet: CRI IAQ testing label.
 - 2. Adhesive: Low VOC type.

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. LEED Submittals:
 - 1. Product Data for Credit EQ 4.3:
 - a. For carpet tile, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program.
 - b. For installation adhesive, documentation including printed statement of VOC content.

D. Samples:

1. Carpet: "Production Quality" samples 300 x 300 mm (12 x 12 inches) of carpets, showing quality, pattern and color specified in Section 09 06 00, SCHEDULE FOR FINISHES.
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.

E. Shop Drawings: Installers layout plan showing seams and cuts for and carpet module.

F. Maintenance Data: Carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods and cleaning cycles.

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. Publication listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American National Standards Institute (ANSI):
ANSI/NSF 140-10.....Sustainable Carpet Assessment Standard
- C. American Association of Textile Chemists and Colorists (AATCC):
AATCC 16-04.....Colorfastness to Light
AATCC 129-10.....Colorfastness to Ozone in the Atmosphere under High Humidities
AATCC 134-11.....Electric Static Propensity of Carpets
AATCC 165-08.....Colorfastness to Crocking: Textile Floor Conerings-AATCC Crockmeter Method
- D. American Society for Testing and Materials (ASTM):
ASTM D1335-05.....Tuft Bind of Pile Yarn Floor Coverings
ASTM D3278-96 (R2004)...Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D5116-10.....Determinations of Organic Emissions from Indoor Materials/Products
ASTM D5252-05.....Operation of the Hexapod Tumble Drum Tester
ASTM D5417-05.....Operation of the Vettermann Drum Tester
ASTM E648-10.....Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
- E. The Carpet and Rug Institute (CRI):
CRI 104-11.....Installation of Commercial Carpet

PART 2 - PRODUCTS

2.1 CARPET

- A. Physical Characteristics:
1. Carpet free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains and other physical and manufacturing defects.
 2. Manufacturers standard construction commercial carpet:
 - a. Modular Tile: 660 mm (24 inches) square tile.
 3. Provide static control to permanently control static build upto less than 2.0 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC 134.
 4. Pile Height: Maximum 3.25 mm (0.10 inch).
 5. Pile Fiber: Nylon with recycled content 25 percent minimum branded (federally registered trademark).

6. Pile Type: Level Loop.
7. Backing materials: Manufacturer's unitary backing designed for glue-down installation using recovered materials.
8. Appearance Retention Rating (ARR): Carpet shall be tested and have the minimum 3.5-4.0 Severe ARR when tested in accordance with either the ASTM D 5252 (Hexapod) or ASTM D 5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified.
9. Tuft Bind: Minimum force of 40 N (10 lb) required to pull a tuft or loop free from carpet backing. Test per ASTM D1335.
10. Colorfastness to Crocking: Dry and wet crocking and water bleed, comply with AATCC 165 Color Transference Chart for colors, minimum class 4 rating.
11. Colorfastness to Ozone: Comply with AATCC 129, minimum rating of 4 on the AATCC color transfer chart.
12. Delamination Strength: Minimum of 440 N/m (2.5 lb/inch) between secondary backing.
13. Flammability and Critical Radiant Flux Requirements:
 - a. Test Carpet in accordance with ASTM E 648.
 - b. Class I: Not less than 0.45 watts per square centimeter.
 - c. Class II: Not less than 0.22 watts per square centimeter.
 - d. Carpet in corridors, exits and Medical Facilities: Class I.
14. Density: Average Pile Yarn Density (APYD):
 - a. Corridors, lobbies, entrances, common areas or multipurpose rooms, open offices, waiting areas and dining areas: Minimum APYD 6000.
 - b. Other areas: Minimum APYD 4000.
15. VOC Limits: Use carpet and carpet adhesive that comply with the following limits for VOC content when tested according to ASTM D 5116:
 - a. Carpet, Total VOCs: 0.5 mg/sq.m x hr.
 - b. Carpet, 4-PC (4-Phenylcyclohexene): 0.05 mg/sq.m x hr.
 - c. Carpet, Formaldehyde: 0.05 mg/sq.m x hr.
 - d. Carpet, Styrene: 0.4 mg/sq.m x hr.
 - e. Adhesive, Total VOCs: 10.00 mg/sq.m x hr.
 - f. Adhesive, Formaldehyde: 0.05 mg/sq.m x hr.
 - g. Adhesive, 2-Ethyl-1-Hexanol: 3.00 mg/sq.m x hr.
- B. Shall meet platinum level of ANSI/NSF 140.
- C. Color, Texture, and Pattern: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.2 ADHESIVE AND CONCRETE PRIMER

- A. Waterproof, resistant to cleaning solutions, steam and water, nonflammable, complies with air-quality standards as specified. Adhesives flashpoint minimum 60 degrees C (140 degrees F), complies with ASTM D 3278.
- B. Seam Adhesives: Waterproof, non-flammable and non-staining.

2.3 EDGE STRIPS (MOLDING)

- A. Metal:
 - 1. Hammered surface aluminum, pinless, clamp down type designed for the carpet being installed.
 - 2. Floor flange not less than 38 mm (1-1/2 inches) wide, face not less than 16 mm (5/8 inch) wide.
 - 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 INSTALLTION

- A. Do not install carpet until work of other trades including painting is complete and dry.
- B. Install in accordance with CRI 104 direct glue down installation.
 1. Relax carpet in accordance with Section 6.4.
 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. 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 other wise 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.

3.4 PROTECTION AND CLEANING

- A. Remove waste, fasteners and other cuttings from carpet floors.
- B. Vacuum carpet and provide suitable protection. Do not use polyethylene film.
- C. Do not permit traffic on carpeted surfaces for at least 48 hours after installation. Protect the carpet in accordance with CRI 104.

- D. Do not move furniture or equipment on unprotected carpeted surfaces.
- E. Just before final acceptance of work, remove protection and vacuum carpet clean.

- - - E N D - - -

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 stripping or markers and identity markings.

1.2 RELATED WORK

- A. Shop prime painting of steel and ferrous metals: Division 05 - METALS, Division 08 - OPENINGS, Division 10 - SPECIALTIES, Division 11 - EQUIPMENT, Division 12 - FURNISHINGS, Division 13 - SPECIAL CONSTRUCTION, Division 14 - CONVEYING EQUIPMENT, 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.
- B. Contractor option: Prefinished flush doors with transparent finishes: Section 08 14 00, INTERIOR WOOD DOORS.
- C. Type of Finish, Color, and Gloss Level of Finish Coat: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Multi-color Textured Wall Finish: Section 09 94 19, MULTICOLOR INTERIOR FINISHING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
Before work is started, or sample panels are prepared, submit manufacturer's literature, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.
- 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.
- F. LEED Submittals:
1. Product Data for Credit IEQ 4.2: For painting and coatings, including printed statement of VOC content and chemical components.

1.4 DELIVERY AND STORAGE

- A. Deliver materials to site in manufacturer's sealed container marked to show following:
1. Name of manufacturer.
 2. Product type.
 3. Batch number.
 4. Instructions for use.
 5. Safety precautions.
- B. In addition to manufacturer's label, provide a label legibly printed as following:
1. Federal Specification Number, where applicable, and name of material.
 2. Surface upon which material is to be applied.
 3. 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 Resident Engineer.
- B. Finish and texture approved by Resident Engineer 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):
ACGIH TLV-BKLT-2012.....Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)
ACGIH TLV-DOC-2012.....Documentation of Threshold Limit Values and Biological Exposure Indices, (Seventh Edition)
- C. American National Standards Institute (ANSI):
A13.1-07.....Scheme for the Identification of Piping Systems
- D. American Society for Testing and Materials (ASTM):
D260-86.....Boiled Linseed Oil
- E. Commercial Item Description (CID):
A-A-1555.....Water Paint, Powder (Cementitious, White and Colors) (WPC) (cancelled)
A-A-3120.....Paint, For Swimming Pools (RF) (cancelled)
- F. Federal Specifications (Fed Spec):
TT-P-1411A.....Paint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls) (CEP)
- G. Master Painters Institute (MPI):
No. 1-12.....Aluminum Paint (AP)
No. 4-12.....Interior/ Exterior Latex Block Filler
No. 5-12.....Exterior Alkyd Wood Primer
No. 7-12.....Exterior Oil Wood Primer
No. 8-12.....Exterior Alkyd, Flat MPI Gloss Level 1 (EO)
No. 9-12.....Exterior Alkyd Enamel MPI Gloss Level 6 (EO)
No. 10-12.....Exterior Latex, Flat (AE)

- No. 11-12.....Exterior Latex, Semi-Gloss (AE)
- No. 18-12.....Organic Zinc Rich Primer
- No. 22-12.....Aluminum Paint, High Heat (up to 590° - 1100F)
(HR)
- No. 26-12.....Cementitious Galvanized Metal Primer
- No. 27-12.....Exterior / Interior Alkyd Floor Enamel, Gloss (FE)
- No. 31-12.....Polyurethane, Moisture Cured, Clear Gloss (PV)
- No. 36-12.....Knot Sealer
- No. 43-12.....Interior Satin Latex, MPI Gloss Level 4
- No. 44-12.....Interior Low Sheen Latex, MPI Gloss Level 2
- No. 45-12.....Interior Primer Sealer
- No. 46-12.....Interior Enamel Undercoat
- No. 47-12.....Interior Alkyd, Semi-Gloss, MPI Gloss Level 5 (AK)
- No. 48-12.....Interior Alkyd, Gloss, MPI Gloss Level 6 (AK)
- No. 49-12.....Interior Alkyd, Flat, MPI Gloss Level 1 (AK)
- No. 50-12.....Interior Latex Primer Sealer
- No. 51-12.....Interior Alkyd, Eggshell, MPI Gloss Level 3
- No. 52-12.....Interior Latex, MPI Gloss Level 3 (LE)
- No. 53-12.....Interior Latex, Flat, MPI Gloss Level 1 (LE)
- No. 54-12.....Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)
- No. 59-12.....Interior/Exterior Alkyd Porch & Floor Enamel, Low
Gloss (FE)
- No. 60-12.....Interior/Exterior Latex Porch & Floor Paint, Low
Gloss
- No. 66-12.....Interior Alkyd Fire Retardant, Clear Top-Coat (ULC
Approved) (FC)
- No. 67-12.....Interior Latex Fire Retardant, Top-Coat (ULC
Approved) (FR)
- No. 68-12.....Interior/ Exterior Latex Porch & Floor Paint,
Gloss
- No. 71-12.....Polyurethane, Moisture Cured, Clear, Flat (PV)
- No. 74-12.....Interior Alkyd Varnish, Semi-Gloss
- No. 77-12.....Epoxy Cold Cured, Gloss (EC)
- No. 79-12.....Marine Alkyd Metal Primer
- No. 90-12.....Interior Wood Stain, Semi-Transparent (WS)
- No. 91-12.....Wood Filler Paste
- No. 94-12.....Exterior Alkyd, Semi-Gloss (EO)
- No. 95-12.....Fast Drying Metal Primer
- No. 98-12.....High Build Epoxy Coating
- No. 101-12.....Epoxy Anti-Corrosive Metal Primer

- No. 108-12.....High Build Epoxy Coating, Low Gloss (EC)
 - No. 114-12.....Interior Latex, Gloss (LE) and (LG)
 - No. 119-12.....Exterior Latex, High Gloss (acrylic) (AE)
 - No. 135-12.....Non-Cementitious Galvanized Primer
 - No. 138-12.....Interior High Performance Latex, MPI Gloss Level 2
(LF)
 - No. 139-12.....Interior High Performance Latex, MPI Gloss Level 3
(LL)
 - No. 140-12.....Interior High Performance Latex, MPI Gloss Level 4
 - No. 141-12.....Interior High Performance Latex (SG) MPI Gloss
Level 5
- H. Steel Structures Painting Council (SSPC):
- SSPC SP 1-04 (R2004)....Solvent Cleaning
 - SSPC SP 2-04 (R2004)....Hand Tool Cleaning
 - SSPC SP 3-04 (R2004)....Power Tool Cleaning

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood Sealer: MPI 31 (gloss) or MPI 71 (flat) thinned with thinner recommended by manufacturer at rate of about one part of thinner to four parts of varnish.
- B. Aluminum Paint (AP): MPI 1.
- C. Exterior Alkyd, Flat (EO): MPI 8.
- D. Exterior Alkyd Enamel (EO): MPI 9.
- E. Exterior Latex, Flat (AE): MPI 10.
- F. Exterior Latex, Semi-Gloss (AE): MPI 11.
- G. Exterior/ interior Alkyd Floor Enamel, Gloss (FE): MPI 27.
- H. Knot Sealer: MPI 36.
- I. Interior Satin Latex: MPI 43.
- J. Interior Low Sheen Latex: MPI 44.
- K. Interior Primer Sealer: MPI 45.
- L. Interior Enamel Undercoat: MPI 47.
- M. Interior Alkyd, Semi-Gloss (AK): MPI 47.
- N. Interior Alkyd, Gloss (AK): MPI 49.
- O. Interior Latex Primer Sealer: MPI 50.
- P. Interior Alkyd, Eggshell: MPI 51
- Q. Interior Latex, MPI Gloss Level 3 (LE): MPI 52.
- R. Interior Latex, Flat, MPI Gloss Level 1 (LE): MPI 53.
- S. Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE): MPI 54.
- T. Interior Wood Stain, Semi-Transparent (WS): MPI 90.

- U. Wood Filler Paste: MPI 91.
- V. Exterior Alkyd, Semi-Gloss (EO): MPI 94.
- W. Fast Drying Metal Primer: MPI 95.
- X. Interior latex, Gloss (LE) and (LG): MPI 114.
- Y. Exterior Latex, High Gloss (acrylic) (AE): MPI 119.
- Z. Waterborne Galvanized Primer: MPI 134.
- AA. Non-Cementitious Galvanized Primer: MPI 135.
- BB. Interior High Performance Latex, MPI Gloss Level 2(LF): MPI 138.
- CC. Interior High Performance Latex, MPI Gloss Level 3 (LL): MPI 139.
- DD. Interior High Performance Latex, MPI Gloss Level 4: MPI 140.
- EE. Interior High Performance Latex (SG), MPI Gloss Level 5: MPI 141.

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): Interior Paint shall comply with LEED requirements. 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.
 - 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.

B. Interior Primers.

1. VOC Content of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Flat paints, Coatings and Primers: VOC content of not more than 50g/L.
 - b. Non-Flat paints, Coatings and Primers: VOC content of not more than 150 g/L.
 - c. Anticorrosive and Anti-Rust paints Applied to Ferrous Metals: VOC content of not more than 250 g/L.
 - e. Floor Coatings: VOC content of not more than 100 g/L.
 - f. Shellacs, Clear: VOC content of not more than 730 g/L.
 - g. Shellacs, Pigmented: VOC content of not more than 550 g/L.
 - h. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
2. Chemical Components of Field-Applied Interior Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: Provide products that comply with the following chemical restrictions:
 - a. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - b. Restricted Components: Paintings and coatings shall not contain any of the following:
 1. Acrolein.
 2. Acrylonitrile.
 3. Antimony.
 4. Benzene.
 5. Butyl benzyl phthalate.
 6. Cadmium.
 7. Di (2-ethylhexyl) phthalate.
 8. Di-n-butyl phthalate.
 9. Di-n-octyl phthalate.
 10. 1,2-dichlorobenzene.
 11. Diethyl phthalate.
 12. Dimethyl phthalate.

13. Ethylbenzene.
14. Formaldehyde.
15. Hexavalent chromium.
16. Isophorone.
17. Lead.
18. Mercury.
19. Methyl ethyl ketone.
20. Methyl isobutyl ketone.
21. Methylene chloride.
22. Naphthalene.
23. Toluene (methylbenzene).
24. 1,1,1-trichloroethane
25. Vinyl chloride.

C. Interior Finish Coats.

1. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - a. Flat Paints, Coatings and Primers: VOC content of not more than 50 g/L.
 - b. Non-Flat Paints, Coatings and Primers: VOC content of not more than 150 g/L.
 - c. Anticorrosive and Anti-Rust paints Applied to Ferrous Metals: VOC content of not more than 250 g/L.
 - d. Floor Coatings: VOC content of not more than 100 g/L.
 - e. Shellacs, Clear: VOC content of not more than 730 g/L.
 - f. Shellacs, Pigmented: VOC content of not more than 550 g/L.
 - g. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
 - h. Dry-Fog Coatings: VOC Content of not more than 400 g/L.
 - i. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
 - j. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.
2. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following chemical restrictions:
 - a. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

- b. Restricted Components: Paintings and coatings shall not contain any of the following:
 - 1. Acrolein.
 - 2. Acrylonitrile.
 - 3. Antimony.
 - 4. Benzene.
 - 5. Butyl benzyl phthalate.
 - 6. Cadmium.
 - 7. Di (2-ethylhexyl) phthalate.
 - 8. Di-n-butyl phthalate.
 - 9. Di-n-octyl phthalate.
 - 10. 1,2-dichlorobenzene.
 - 11. Diethyl phthalate.
 - 12. Dimethyl phthalate.
 - 13. Ethylbenzene.
 - 14. Formaldehyde.
 - 15. Hexavalent chromium.
 - 16. Isophorone.
 - 17. Lead.
 - 18. Mercury.
 - 19. Methyl ethyl ketone.
 - 20. Methyl isobutyl ketone.
 - 21. Methylene chloride.
 - 22. Naphthalene.
 - 23. Toluene (methylbenzene).
 - 24. 1,1,1-trichloroethane
 - 25. Vinyl chloride.
- D. Wood Stains and Varnishes.
 - 1. VOC Content of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - a. Clear Wood Finishes, Varnishes: VOC content of not more than 350 g/L.
 - b. Clear Wood Finishes, Lacquers: VOC content of not more than 550 g/L.
 - c. Floor Coatings: VOC content of not more than 100 g/L.
 - d. Shellacs, Clear: VOC content of not more than 730 g/L.
 - e. Shellacs, Pigmented: VOC content of not more than 550 g/L.
 - f. Stains: VOC content of not more than 250 g/L.

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 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 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, Aluminum, 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. Neutralize Concrete floors to be painted by washing with a solution of 1.4 Kg (3 pounds) of zinc sulfate crystals to 3.8 L (1 gallon) of water, allow to dry three days and brush thoroughly free of crystals.
 4. Repair broken and spalled concrete edges with concrete patching compound to match adjacent surfaces as specified in CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.
- G. Gypsum Plaster and Gypsum Board:
1. Remove efflorescence, loose and chalking plaster or finishing materials.
 2. Remove dust, dirt, and other deterrents to paint adhesion.
 3. Fill holes, cracks, and other depressions with CID-A-A-1272A [Plaster, Gypsum (Spackling Compound) finished flush with adjacent surface, with

texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.3 PAINT PREPARATION

- A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.
- B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.
- C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.
- D. Mix two component and two part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.
- E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.4 APPLICATION

- A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.
- B. Unless otherwise specified, apply paint in three coats; prime, body, and finish. When two coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.
- C. Apply each coat evenly and cover substrate completely.
- D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by Resident Engineer.
- 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 Resident Engineer, 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.
- D. Prime rebates for stop and face glazing of wood, and for face glazing of steel.
- E. Wood and Wood Particleboard:
 - 1. Use same kind of primer specified for exposed face surface.
 - a. Interior wood except for transparent finish: MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat), thinned if recommended by manufacturer.
 - b. Transparent finishes as specified under Transparent Finishes on Wood except Floors.
 - 2. Apply two coats of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) to surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reason.
 - 3. Apply one coat of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) as soon as delivered to site to surfaces of unfinished woodwork, except concealed surfaces of shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish.
 - 4. Apply MPI 67 (Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR) to wood for fire retardant finish.
- F. Metals except boilers, incinerator stacks, and engine exhaust pipes:
 - 1. Steel and iron: MPI 95 (Fast Drying Metal Primer). Use MPI 101 (Cold Curing Epoxy Primer) where MPI 77 (Epoxy Cold Cured, Gloss (EC)) MPI 98 (High Build Epoxy Coating) finish is specified.
 - 2. Zinc-coated steel and iron: MPI 135 (Non-Cementitious Galvanized Primer).
 - 3. Aluminum scheduled to be painted: MPI 95 (Fast Drying Metal Primer).

4. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel (EO)).
5. Asphalt coated metal: MPI 1 (Aluminum Paint (AP)).

G. Gypsum Board:

1. Surfaces scheduled to have MPI 53 (Interior Latex, Flat), MPI Gloss Level 1 (LE)) MPI 52 (Interior Latex, MPI Gloss Level 3 (LE)) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)) MPI 114 (Interior Latex, Gloss (LE) and (LG)) finish: Use MPI 53 (Interior Latex, MPI Gloss Level 3 (LE)) MPI 52 (Interior Latex, MPI Gloss Level 3 (LE)) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)) MPI 114 (Interior Latex, Gloss (LE) and (LG)) respectively.
2. Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) in shower and bathrooms.
3. Surfaces scheduled to receive vinyl coated fabric wallcovering: Use MPI 45 (Interior Primer Sealer)

H. Cement Plaster or stucco Interior Surfaces of Ceilings and Walls:

1. MPI 53 (Interior Latex, Flat, MPI Gloss Level 1 (LE)) MPI 52 (Interior Latex, MPI Gloss Level 3 (LE)) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)) MPI 114 (Interior Latex, Gloss (LE) and (LG)) except use two coats where substrate has aged less than six months.
2. Use MPI 138 (Interior High Performance Latex, MPI Gloss Level 2 (LF)) MPI 139 (Interior High Performance Latex, MPI Gloss level 3 (LL)) MPI 140 (Interior High Performance latex, MPI Gloss Level 4) MPI 141 (Interior High Performance Latex (SG) MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss (LE) and (LG))

3.6 EXTERIOR FINISHES

- A. Apply following finish coats where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Steel and Ferrous Metal:
 1. Two coats of MPI 8 (Exterior Alkyd, Flat (EO)) MPI 9 (Exterior Alkyd Enamel (EO)) MPI 94 (Exterior Alkyd, Semi-Gloss (EO)) on exposed surfaces, except on surfaces over 94 degrees C (200 degrees F).
- C. Machinery without factory finish except for primer: One coat MPI 94 (Exterior Alkyd, Semi-Gloss (EO)).
- D. Cement Plaster Concrete:
 1. General:
 - a. Where specified in Section 09 06 00, SCHEDULE FOR FINISHES or shown.
 - b. Mix as specified in manufacturer's printed directions.
 - c. Do not mix more paint at one time than can be used within four hours after mixing. Discard paint that has started to set.

- d. Dampen warm surfaces above 24 degrees C (75 degrees F) with fine mist of water before application of paint. Do not leave free water on surface.
- e. Cure paint with a fine mist of water as specified in manufacturer's printed instructions.
- 2. Use two coats of TT-P-1411 (Paint, Co-polymer-Resin, Cementitious (CEP)), unless specified otherwise.

3.7 INTERIOR FINISHES

- A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Metal Work:
 - 1. Apply to exposed surfaces.
 - 2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
 - 3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
 - a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) unless specified otherwise.
 - b. Two coats of MPI 48 (Interior Alkyd Gloss (AK)) c. One coat of MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) on exposed interior surfaces of alkyd-amine enamel prime finished windows.
 - d. Machinery: One coat MPI 9 (Exterior Alkyd Enamel (EO)).
 - e. Asphalt Coated Metal: One coat MPI 1 (Aluminum Paint (AP)).
- C. Gypsum Board:
 - 1. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3 (LL)).
 - 2. Two coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2 (LF)).
 - 3. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)) or MPI 114 (Interior Latex, Gloss (LE) and (LG)).
 - 4. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 48 (Interior Alkyd Gloss (AK)).
- D. Wood:
 - 1. Sanding:
 - a. Use 220-grit sandpaper.
 - b. Sand sealers and varnish between coats.
 - c. Sand enough to scarify surface to assure good adhesion of subsequent coats, to level roughly applied sealer and varnish, and to knock off "whiskers" of any raised grain as well as dust particles.

2. Sealers:

- a. Apply sealers specified except sealer may be omitted where pigmented, penetrating, or wiping stains containing resins are used.
- b. Allow manufacturer's recommended drying time before sanding, but not less than 24 hours or 36 hours in damp or muggy weather.
- c. Sand as specified.

3. Paint Finish:

- a. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) (SG).
- b. One coat of MPI 45 Interior Primer Sealer) plus one coat of MPI 48 (Interior Alkyd Gloss (AK)).
- c. Two coats of MPI 51 (Interior Alkyd, Eggshell) (AK)).

4. Transparent Finishes on Wood Except Floors.

a. Natural Finish:

- 1) One coat of sealer as written in 2.1 E.
- 2) Two coats of MPI 31 (Polyurethane, Moisture Cured, Clear Gloss (PV)).

b. Stain Finish:

- 1) One coat of MPI 90 (Interior Wood Stain, Semi-Transparent (WS)).
- 2) Use wood stain of type and color required to achieve finish specified. Do not use varnish type stains.
- 3) One coat of sealer as written in 2.1 E.
- 4) Two coats of MPI 31 (Polyurethane Moisture Cured, Clear Gloss (PV)).

c. Varnish Finish:

- 1) One coat of sealer as written in 2.1 E.
- 2) Two coats of MPI 31 (Polyurethane Moisture Cured, Clear Gloss (PV)).

E. Miscellaneous:

1. Apply where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
2. MPI 1 (Aluminum Paint): Two coats of aluminum paint.

3.8 REFINISHING EXISTING PAINTED SURFACES

- A. Clean, patch and repair existing surfaces as specified under surface preparation.
- B. Remove and reinstall items as specified under surface preparation.
- C. Remove existing finishes or apply separation coats to prevent non compatible coatings from having contact.
- D. Patched or Replaced Areas in Surfaces and Components: Apply spot prime and body coats as specified for new work to repaired areas or replaced components.

- E. Except where scheduled for complete painting apply finish coat over plane surface to nearest break in plane, such as corner, reveal, or frame.
- F. In existing rooms and areas where alterations occur, clean existing stained and natural finished wood retouch abraded surfaces and then give entire surface one coat of MPI 31 (Polyurethane, Moisture Cured, Clear Gloss)
- G. 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 of priming coat: Lighter than body coat.
 - 2. Color of body coat: Lighter than finish coat.
 - 3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.
- D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:
 - 1. Paint to match color of casework where casework has a paint finish.
 - 2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.10 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE

- A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.
- B. In spaces not scheduled to be finish painted in Section 09 06 00, SCHEDULE FOR FINISHES paint as specified under paragraph H, colors.
- C. Paint various systems specified in Division 02 - EXISTING CONDITIONS, Division 21 - FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 - HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 - ELECTRONIC SAFETY AND SECURITY.
- D. Paint after tests have been completed.

- E. Omit prime coat from factory prime-coated items.
- F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.
- G. Omit field painting of items specified in paragraph, Building and Structural WORK NOT PAINTED.
- H. Color:
 - 1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
 - 2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:
 - a. WhiteExterior 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.
 - g. Match existing.
- I. Apply paint systems on properly prepared and primed surface as follows:
 - 1. Exterior Locations:
 - a. Apply two coats of MPI 8 (Exterior Alkyd, Flat (EO)) to the following ferrous metal items:
Vent and exhaust pipes with temperatures under 94 degrees C

(200 degrees F), roof drains, fire hydrants, post indicators, yard hydrants, exposed piping and similar items.

- b. Apply two coats of MPI 10 (Exterior Latex, Flat (AE)) to the following metal items:

Galvanized and zinc-copper alloy metal.

2. Interior Locations:

- a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) to following items:

- 1) Metal under 94 degrees C (200 degrees F) of items such as bare piping, fittings, hangers and supports.

- 2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.

- 3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.

- b. Paint electrical conduits containing cables rated 600 volts or more using two coats of MPI 94 (Exterior Alkyd, Semi-gloss (EO)) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.

3. Other exposed locations:

- a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two coats of MPI 1 (Aluminum Paint (AP)).

- b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One coat of MPI 50 (Interior Latex Primer Sealer) and one coat of MPI 10 (Exterior Latex, Flat (AE)).

3.11 BUILDING AND STRUCTURAL WORK FIELD PAINTING

- A. Painting and finishing of interior and exterior work except as specified under paragraph 3.11 B.

- 1. Painting and finishing of new and existing work including colors and gloss of finish selected is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.

- 2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.

- 3. Painting of ferrous metal and galvanized metal.

- 4. Identity painting and safety painting.

- B. Building and Structural Work not Painted:

- 1. Prefinished items:

- a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
 - b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
2. Finished surfaces:
 - a. Hardware except ferrous metal.
 - b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
 - c. Signs, fixtures, and other similar items integrally finished.
3. Concealed surfaces:
 - a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
 - b. Inside walls or other spaces behind access doors or panels.
 - c. Surfaces concealed behind permanently installed casework and equipment.
4. Moving and operating parts:
 - a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
 - b. Tracks for overhead or coiling doors, shutters, and grilles.
5. Labels:
 - a. Code required label, such as Underwriters Laboratories Inc., 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 foundations 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.

3.12 IDENTITY PAINTING SCHEDULE

- A. Identify designated service in accordance with ANSI A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels.
 1. Legend may be identified using 2.1 G options or by stencil applications.
 2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12 000 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 BBREVIATIONS
Blow-off		Yellow	Black	Blow-off
Boiler Feedwater		Yellow	Black	Blr Feed
A/C Condenser Water Supply		Green	White	A/C Cond Wtr Sup
A/C Condenser Water Return		Green	White	A/C Cond Wtr Ret
Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Shop Compressed Air		Yellow	Black	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower

High Pressure Steam		Yellow	Black	H.P. _____*
High Pressure Condensate Return		Yellow	Black	H.P. Ret _____*
Medium Pressure Steam		Yellow	Black	M. P. Stm _____*
Medium Pressure Condensate Return		Yellow	Black	M.P. Ret _____*
Low Pressure Steam		Yellow	Black	L.P. Stm _____*
Low Pressure Condensate Return		Yellow	Black	L.P. Ret _____*
High Temperature Water Supply		Yellow	Black	H. Temp Wtr Sup
High Temperature Water Return		Yellow	Black	H. Temp Wtr Ret
Hot Water Heating Supply		Yellow	Black	H. W. Htg Sup
Hot Water Heating Return		Yellow	Black	H. W. Htg Ret
Gravity Condensate Return		Yellow	Black	Gravity Cond Ret
Pumped Condensate Return		Yellow	Black	Pumped Cond Ret
Vacuum Condensate Return		Yellow	Black	Vac Cond Ret
Fuel Oil - Grade		Brown	White	Fuel Oil-Grade ____*
(Diesel Fuel included under Fuel Oil)				
Boiler Water Sampling		Yellow	Black	Sample
Chemical Feed		Yellow	Black	Chem Feed
Continuous Blow-Down		Yellow	Black	Cont. B D
Pumped Condensate		Black		Pump Cond
Pump Recirculating		Yellow	Black	Pump-Recirc.
Vent Line		Yellow	Black	Vent
Alkali		Yellow	Black	Alk
Bleach		Yellow	Black	Bleach
Detergent		Yellow	Black	Det
Liquid Supply		Yellow	Black	Liq Sup
Reuse Water		Yellow	Black	Reuse Wtr
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water		Green	White	RG
Reverse Osmosis		Green	White	RO
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch

Chemical Resistant Pipe

Waste	Yellow	Black	Acid Waste
Vent	Yellow	Black	Acid Vent
Atmospheric Vent	Green	White	ATV
Silver Recovery	Green	White	Silver Rec
Oral Evacuation	Green	White	Oral Evac
Fuel Gas	Yellow	Black	Gas
Fire Protection Water			
Sprinkler	Red	White	Auto Spr
Standpipe	Red	White	Stand
Sprinkler	Red	White	Drain

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. Medical Gases and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR HEALTHCARE FACILITIES and Section 22 63 00, GAS SYSTEMS FOR HEALTHCARE FACILITIES.
 - b. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS and Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS.

B. Fire and Smoke Partitions:

1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
3. Locate not more than 6100 mm (20 feet) on center on corridor sides of partitions, and with a least one message per room on room side of partition.
4. Use semigloss paint of color that contrasts with color of substrate.

C. Identify columns in pipe basements and interstitial space:

1. Apply stenciled number and letters to correspond with grid numbering and lettering shown.
2. Paint numbers and letters 100 mm (4 inches) high, locate 450 mm (18 inches) below overhead structural slab.

3. Apply on four sides of interior columns and on inside face only of exterior wall columns.
4. Color:
 - a. Use black on concrete columns.
 - b. Use white or contrasting color on steel columns.

3.13 PROTECTION CLEAN UP, AND TOUCH-UP

- A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.
- C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

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APPENDIX

Coordinate the following abbreviations used in Section 09 91 00, PAINTING, with other Sections, especially Section 09 06 00, SCHEDULE FOR FINISHES and other COATING SECTIONS listed. Use the same abbreviation and terms consistently.

<u>Paint or coating</u>	<u>Abbreviation</u>
Acrylic Emulsion	AE (MPI 10 - flat/MPI 11 - semigloss/MPI 119 - gloss)
Alkyd Flat	Ak (MPI 49)
Alkyd Gloss Enamel	G (MPI 48)
Alkyd Semigloss Enamel	SG (MPI 47)
Aluminum Paint	AP (MPI 1)
Cementitious Paint	CEP (TT-P-1411)
Exterior Latex	EL??(MPI 10 / 11 / 119)??
Exterior Oil	EO (MPI 9 - gloss/MPI 8 - flat/MPI 94 - semigloss)
Epoxy Coating	EC (MPI 77 - walls, floors/MPI 108 - CMU, concrete)
Fire Retardant Paint	FR (MPI 67)
Fire Retardant Coating (Clear)	FC (MPI 66, intumescent type)
Floor Enamel	FE (MPI 27 - gloss/MPI 59 - eggshell)
Heat Resistant Paint	HR (MPI 22)
Latex Emulsion	LE (MPI 53, flat/MPI 52, eggshell/MPI 54, semigloss/MPI 114, gloss Level 6
Latex Flat	LF (MPI 138)
Latex Gloss	LG (MPI 114)
Latex Semigloss	SG (MPI 141)
Latex Low Luster	LL (MPI 139)
Plastic Floor Coating	PL
Polyurethane Varnish	PV (MPI 31 - gloss/MPI 71 - flat)
Rubber Paint	RF (CID-A-A-3120 - Paint for Swimming Pools (RF)).
Water Paint, Cement	WPC (CID-A-A-1555 - Water Paint, Powder).
Wood Stain	WS (MPI 90)

Verify abbreviations used in the following coating sections:

Section 09 96 59, HIGH-BUILD GLAZED COATINGS	GC
Section 09 94 19, MULTICOLOR INTERIOR FINISHING	MC

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SECTION 09 94 19
MULTICOLOR INTERIOR FINISHING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. A water or solvent based multicolored coating that is sprayed over primed interior surfaces to obtain a decorative polychromatic finish.

1.2 RELATED WORK

- A. Location and color and texture of finish coat: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Painting: Section 09 91 00, PAINTING.
- C. Gypsum Board: Section 09 29 00, GYPSUM BOARD.

1.3 QUALITY ASSURANCE

- A. Use only qualified trained applicators for mixing and application of coating.
- B. Coverage and hide shall be complete. When color, stain, dirt, or undercoats show through final coat of multi-color coating, the surface shall be covered by additional coats until the coating film is of uniform finish, color appearance, and coverage.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. Material samples, 150 mm (six inches) square, showing the number of coats of coating material on each substrate to which the material is to be applied. Apply coating to the samples in a setback procedure, leaving exposed a portion of the substrate and subsequent portions of each coat.
 - 2. Color samples, minimum 75 mm by 125 mm (three inches by five inches), of each color specified.
- C. Certificates:
 - 1. Letter of certification from the manufacturer stating that the applicator is approved for the multi-color coating material furnished.
 - 2. Letter of certification stating the technicians to be utilized for the application of the multi-color coating material have been trained by the coating manufacturer. Certification shall include statement that specialized equipment as required by the coating manufacturer will be used in the application of the multi-color coating.
- D. Manufacturer's Literature and Data:
 - 1. Literature and data describing the coating material to be furnished.

2. Printed application instructions for each substrate.

E. LEED Submittals:

1. Product Data for Credit IEQ 4.2: For painting and coatings, including printed statement of VOC content and chemical components.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original containers, (seals unbroken) bearing factory-applied labels intact.
- B. Store materials in one location designated by the Resident Engineer. Keep storage area clean, orderly, and well ventilated. Keep all waste and rags in metal containers, tightly covered, and safely dispose of at the end of each working day. Observe all precautions to avoid danger of fire. Provide approved type fire extinguishers immediately outside storage area. Maintain temperature in storage areas, at no less than 10°C (50 degrees F).

1.6 JOB CONDITIONS AND COORDINATION

- A. Do not apply coating materials when temperature is below 10°C (50 degrees F). In order to prevent mildew, and improper drying of coating, provide adequate ventilation for escape of moisture from building. Once application has commenced, prevent wide variation of temperatures which might result in condensation on freshly coated surfaces.
- B. Before application is started in any area, broom clean and remove excessive dust.
- C. After application operations have begun in a given area, broom cleaning is prohibited; clean only with commercial vacuum cleaning equipment.
- D. Adequate illumination shall be provided in all areas where application operations are in progress.
- E. This work shall be scheduled and coordinated with other trades and shall not proceed until other work and job conditions are as required to achieve satisfactory results.
- F. Multi-color coating application shall be completed prior to installation of mechanical and electrical device cover plates.

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 basic designation only.
- B. The Master Painters Institute (MPI):
Approved Product List - March 2013
- C. American Society for Testing and Materials (ASTM):
E84-10.....Surface Burning Characteristics of Building
Materials

PART 2 - PRODUCTS

2.1 MULTI-COLORED COATING

- A. Low odor, Class A Fire rated and listed per ASTM E84, bacteriostatic per MPI No. 112, plastic terpolymer coating, incorporating a high resistance to fungus, mildew, alkalinity, soil and abrasion.
- B. All materials shall be used only as specified by manufacturer's direction label on the container or other technical publications.
- C. Primer shall be approved MPI No. 125. These shall bear identifying labels on the containers. Thinners, if necessary, shall only be those as recommended by the manufacturer for the material being thinned.
- D. All coating materials and equipment shall be compatible in use; finish coats shall be compatible with foundation coatings, overcoatings and the surfaces to be coated; all tools and equipment shall be compatible with the coating to be applied.
- E. Provide ready mixed multi-color coating materials. Job tinting and mixing is not acceptable.

PART 3 - EXECUTION

3.1 INSPECTION AND ACCEPTANCE OF SURFACES

- A. Follow manufacturer's instructions carefully so as to apply materials only to surfaces which are acceptable.
- B. Before starting any work, surfaces to receive multi-color coatings shall be examined carefully for defects which cannot be corrected by the procedures specified under Article, PREPARATION OF SURFACES and which might prevent satisfactory results. Work shall not proceed until defects are corrected.
- C. Application of coating materials shall constitute acceptance of the surface, and shall obligate Contractor for such repair as are necessary to repair any unsatisfactory finish resulting.

3.2 PREPARATION OF SURFACES

- A. Prior to surface preparation and application operations, completely mask, remove, or otherwise adequately protect hardware, accessories, machined surfaces, plates, lighting fixtures, and similar items not scheduled to receive multi-color coating.
- B. Before applying multi-color coating, thoroughly clean all surfaces involved. Schedule cleaning so that dust and other contaminants from the cleaning process do not fall on wet, newly coated surfaces.
- C. All surfaces shall be clean, dry and adequately protected from dampness. Surfaces shall be smooth, even, and true to plane, and free of any

foreign material which will adversely affect adhesion or appearance of applied coating.

- D. Mildew shall be removed and neutralized.
- E. Before coating is applied, surfaces shall be tested with moisture-testing device. No coating shall be applied when moisture content exceeds 12 percent except as may be required by the manufacturer of the coating materials used. Test sufficient area in each space, and as often as necessary to determine the proper moisture content for application.
- F. Prime surfaces to receive multi-color coating with primer recommended by coating manufacturer. Use stark white primer. No top coating will be allowed if primer is any other color than stark white.
- G. Sand and reprime all abrasions and damaged spots in the surface of the prime coat before proceeding with subsequent finish coat.

3.3 APPLICATION

- A. Follow manufacturer's printed recommendations and instructions in application of multi-color coating materials.
- B. Apply multi-color coating material by using high velocity, pressure differential spray technique, with variable control to assure uniform distribution and 100 percent full coat (continuous) coverage.
- C. Equipment shall be kept clean and in proper condition to provide best quality work.
- D. Evenly spread and smoothly apply materials free of runs, sags, holidays, lap marks, air bubbles, and pin holes to assure a smooth finish.
- E. Suction or hot spots shall be touched up.
- F. Finish material shall be applied in one coat over properly primed surfaces according to manufacturer's instructions and as required to meet specified requirements for sheen, texture and color.
- G. Should any coat of coating be adjudged unsatisfactory, it shall be sandpapered or removed and additional coats applied as necessary until satisfactory finish is achieved.
- H. Finish coat shall be MPI No. 121, clear top coat for multicolored coatings. Apply per manufacturers' instructions.

3.4 PROTECTION AND CLEAN UP

- A. Protect the adjacent work and materials by suitable covering or other method, during application of the textured coating. Upon completion of the work, remove all coating material spots from the floors, glass and other surfaces. Remove from the premises all rubbish and accumulated materials and leave the work in clean, orderly and acceptable condition.
- B. Contractor shall repair and recoat damaged surfaces. Repair and recoat damaged surfaces at no additional expense to the Government.

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SECTION 10 11 13
MARKERBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies markerboards, magnetic markerboards and related items.
- B. Boards may be either factory or field assembled.

1.2 RELATED WORK

- A. Color of aluminum anodic coating and magnetic markerboard writing surface: Section 09 06 00, SCHEDULE FOR FINISHES

1.3 QUALITY ASSURANCE

- A. Boards shall be the products of one manufacturer.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Shop Drawings: Identifying all parts by name and material and showing design, construction, installation, anchorage and relation to adjacent construction.
- C. Manufacturer's Literature and Data:
 - 1. Magnetic Markerboard
- D. Samples:
 - 1. Magnetic Markerboard writing surface, 300 by 300 mm (six by six inches), each color, mounted on backing.
 - 2. Integrally colored anodized aluminum, 300 mm (six inch) length.
 - 3. Each accessory (after approval, may be used in the work).

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 National Standards (ANSI):
 - Z97.1-09.....Safety Glazing Materials Used in Buildings -
Safety Performance Specifications and Methods of
Test
- C. American Society for Testing and Materials (ASTM):
 - B221/B221M-08.....Aluminum and Aluminum Alloy Extruded Bars, Rods,
Wire, Shapes and Tubes
 - C1036-06.....Flat Glass
 - C1048-04.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated
and Uncoated Glass

- F104-03(R2009).....Nonmetallic Gasket Materials
- D. Composite Panel Association (CPA):
- A208.1-09.....Particleboard
- A135.4-04.....Basic Hardboard
- E. Porcelain Enamel Institute (PEI)
- 1001-11.....Architectural Porcelain Enamel

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Magnetic Markerboard Product:
1. Skyline Design
 2. 1'4" thick Vitracolor Magnetic Markerglass with face-mounted marker rail and custom VA Logo graphic (4"x4")
 3. Custom Size: As noted on the drawings
 4. Accessories: Rare Earth magnets - Two (2) per Patient Room

2.1 MAGNETIC MARKERBOARDS AND MARKERBOARDS

- A. Magnetic Markerboards shall consist of a writing surface, face-mounted marker rail and accessories, and other items specified and shown.
- B. Markerboards shall consist of a writing surface, snap on aluminum frame, marker trough, mullions, display rail and accessories, grounds and other items specified and shown.

2.2 FABRICATION

- A. Materials:
1. 1/4" thick tempered glass
 2. Aluminum, extruded: ASTM B221.
 3. Backing: Hardboard, AHBA A135.4 or particleboard, CPA A208.1.
- B. Components:
1. Writing Surface: Factory assembly consisting of face sheet of 24 gauge sheet steel with porcelain enamel board texture finish conforming to PEI 1001, laminated to a hardboard or particleboard backing, 9 mm to 13 mm (3/8 to 1/2-inch) thick, and a 0.13 mm (0.005-inch) thick aluminum foil back sheet laminated to back-face.
 2. Frames (Trim): Extruded aluminum, 1.5 mm (0.060-inch) thick, snap-on type, approximate face width 44 mm (1-3/4 inch), depth and configuration as required to return to wall and engage clips.
 3. Trough: Extruded aluminum, 2.34 mm (0.092-inch) thick, not less than 75 mm (3-inch) projection from writing surface with grooved top surface, closed ends and return to wall surface at underside. Design to be snap-on type with concealed fasteners.

4. Accessories: Fabricate from aluminum with holders from spring steel. Design to suit display rail.
 5. Mullions: Snap-on type, same material and face width as frames, designed to finish flush with frame.
 6. Grounds: Continuous zinc-coated (galvanized) steel or extruded aluminum members designed to support the board writing surface and clips for snap-on frames, map rail and marker tray.
 7. Clips: Manufacturer's standard as required to support frame, mullions, display rail, and trough.
- C. Boards 3660 mm (12 feet) or less in length shall be in one piece.
- D. Finish exposed aluminum surfaces as follows:
1. AA 45 chemically etched medium matte, with clear anodic coating Class II Architectural, 0.4 mils thick (AA-M12C22A32).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install units in accordance with the manufacturer's installation instructions, use concealed fasteners.
- B. Inspect surfaces and related construction to receive units. Partitions shall have reinforcing to receive fasteners. Verify type and placement of reinforcement.
- C. Do not proceed with the installation until reinforcement is in place and surfaces are flat.
- D. Assemble units as specified by the manufacturer.

3.2 INSTALLATION OF MARKERBOARDS

- A. Mount board with adhesive and blocking pads spaced 16 inches on center each way.
- B. Grounds designed to receive clips for snap-on trim shall be continuous and be secured 300 mm (12 inches) on center. Space clips 300 mm (12 inches) on center.
- C. Miter trim at corners, conceal fasteners. Modify trim as required to conform to surrounding construction details.

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SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies interior signage for room numbers, directional signs, code required signs, telephone identification signs and temporary interior signs.

1.2 RELATED WORK

- A. Electrical: Related Electrical Specification Sections.
- B. Lighted EXIT signs for egress purposes are specified under Division 26, ELECTRICAL.
- C. Section 10 14 00, SIGNAGE.
- D. Color Finish: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 MANUFACTURER'S QUALIFICATIONS

- A. Sign manufacturer shall provide evidence that they regularly and presently manufactures signs similar to those specified in this section as one of their principal products.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Samples: Sign panels and frames, with letters and symbols, each type. Submit 2 sets. One set of samples will be retained by Resident Engineer, other returned to Contractor.
 - 1. Sign Panel, 200 mm x 250 mm (8 inches x 10 inches), with letters.
 - 2. Color samples of each color, 150 mm x 150 mm (6 inches x 6 inches. Show anticipated range of color and texture.
 - 3. Sample of typeface, arrow and symbols in a typical full size layout.
- C. Manufacturer's Literature:
 - 1. Showing the methods and procedures proposed for the concealed anchorage of the signage system to each surface type.
 - 2. Manufacturer's printed specifications, anchorage details, installation and maintenance instructions.
- D. Samples: Sign location plan, showing location, type and total number of signs required.
- E. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.
- F. Full size layout patterns for dimensional letters.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.
- B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.
- C. Deliver signs only when the site and mounting services are ready for installation work to proceed.
- D. Store products in dry condition inside enclosed facilities.

1.6 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):
 - B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
 - B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and tubes.
- C. Federal Specifications (Fed Spec):
 - MIL-PRF-8184F.....Plastic Sheet, Acrylic, Modified.
 - MIL-P-46144C.....Plastic Sheet, Polycarbonate

1.7 MINIMUM SIGN REQUIREMENTS

- A. Permanent Rooms and Spaces:
 - 1. Tactile and Braille Characters, raised minimum 0.793 mm (1/32 in). Characters shall be accompanied by Grade 2 Braille.
 - 2. Type Styles: Characters shall be uppercase, Helvetica Medium, Helvetica Medium Condensed and Helvetica Regular.
 - 3. Character Height: Minimum 16 mm (5/8 in) high, Maximum 50 mm (2 in).
 - 4. Symbols (Pictograms): Equivalent written description shall be placed directly below symbol, outside of symbol's background field. Border dimensions of symbol background shall be minimum 150 mm (6 in) high.
 - 5. Finish and Contrast: Characters and background shall be eggshell, matte or other non-glare finish with adequate contrast with background.
 - 6. Mounting Location and Height: As shown. Mounted on wall adjacent to the latch side of the door and to avoid door swing and protruding objects.
- B. Overhead Signs:
 - 1. Type Styles: As shown. Characters shall have a width-to-height ratio between 3:5 and 1:1. Characters shall have a stroke width-to-height ratio of between 1:5 and 1:10.

2. Character Height: minimum 75 mm (3 in) high for overhead signs. As shown, for directional signs.
3. Finish and Contrast: Same as for signs of permanent rooms and spaces.
4. Mounting Location and Height: As shown.

1.8 COLORS AND FINISHES:

Section 09 06 00, SCHEDULE FOR FINISHES.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Signs of type, size and design shown on the drawings and as specified.
- B. Signs complete with lettering, framing and related components for a complete installation.
- C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- D. Do not scale drawings for dimensions. Contractor to verify and be responsible for all dimensions and conditions shown by these drawings. Resident Engineer to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.
- E. The Sign Contractor, by commencing work of this section, assumes overall responsibility, as part of his warranty of work, to assure that assemblies, components and parts shown or required within the work of the section, comply with the Contract Documents. The Contractor shall further warrant: That all components, specified or required to satisfactorily complete the installation are compatible with each other and with conditions of installations.

2.2 PRODUCTS

- A. Aluminum:
 1. Sheet and Plate: ASTM B209.
 2. Extrusions and Tubing: ASTM B221.
- B. Cast Acrylic Sheet: MIL-PRF-8184F; Type II, class 1, Water white non-glare optically clear. Matt finish water white clear acrylic shall not be acceptable.
- C. Polycarbonate: MIL-P-46144C; Type I, class 1.
- D. Vinyl: 0.1 mm thick machine cut, having a pressure sensitive adhesive and integral colors.
- E. Electrical Signs:

1. General: Furnish and install all lighting, electrical components, fixtures and lamps ready for use in accordance with the sign type drawings, details and specifications.
2. Refer to Electrical Specifications Section, Division 26, ELECTRICAL, to verify line voltages for sign locations that require electrical signs.
3. Quality Control: Installed electrical components and sign installations are to bear the label and certification of Underwriter's Laboratories, Inc., and are to comply with National Electrical Code as well as applicable federal, state and local codes for installation techniques, fabrication methods and general product safety.
4. Ballast and Lighting Fixtures: See Electrical Specifications.

2.3 SIGN STANDARDS

A. Topography:

1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps as indicated in Sign Message Schedule.
2. Arrow: See graphic standards in drawings.
3. Letter spacing: See graphic standards on drawings.
4. Letter spacing: See graphic standards on drawings.
5. All text, arrows, and symbols to be provided in size, colors, typefaces and letter spacing shown. Text shall be a true, clean, accurate reproduction of typeface(s) shown. Text shown in drawings are for layout purposes only; final text for signs is listed in Sign Message Schedule.

B. Project Colors and Finishes: See Section 09 06 00, SCHEDULE FOR FINISHES.

2.4 SIGN TYPES

A. General:

1. The interior sign system is comprised of sign types families that are identified by a letter and number which identify a particular group of signs. An additional number identifies a specific type of sign within that family.

B. Interchangeable Component System:

1. Sign Type Families: 03, 04, 05, 06, 07, 08, 09 10, 11 12, 13, 14, 15, 16 and 17.
2. Interior sign system capable of being arranged in a variety of configurations with a minimum of attachments, devices and connectors.

- a. Interchangeable nature of the system shall allow for changes of graphic components of the installed sign, without changing sign in its entirety.
 - b. Component Sign System is comprised of the following primary components:
 - 1) Rail Back utilizing horizontal rails, spaced to allow for uniform, modular sizing of sign types.
 - 2) Rail Insert mounted to back of Copy Panels to allow for attachment to Rail Back.
 - 3) Copy Panels, made of a variety of materials to allow for different graphic needs.
 - 4) End Caps which interlock to Rail Back to enclose and secure changeable Copy Panels.
 - 5) Joiners and Accent Joiners connect separate Rail Backs together.
 - 6) Top Accent Bars which provide decorative trim cap that encloses the top of sign or can connect the sign to a Type 03 Room Number Sign.
 - c. Rail Back, Rail Insert and End Caps in anodized extruded aluminum to allow for tight tolerances and consistent quality of fit and finish.
 - d. Signs in system shall be convertible in the field to allow for enlargement from one size to another in height and width through use of Joiners or Accent Joiners, which connect Rail Back panels together blindly, providing a butt joint between Copy Panels. Accent Joiners shall connect Rail Backs together with a visible 3 mm (1/8") horizontal rib, flush to the adjacent copy insert surfaces.
 - e. Sign configurations shall vary in width from 225 mm (9 inches) to 2050 mm (80 inches), and have height dimensions of 50 mm (2 inches), 75 mm (3 inches), 150 mm (6 inches), 225 mm (9 inches) and 300 mm (12 inches). Height shall be increased beyond 300 mm (12 inches), by repeating height module in full or in part.
3. Rail Back functions as internal structural member of sign using 6063T5 extruded aluminum and anodized black.
- a. Shall accept an extruded aluminum or plastic insert on one sign or on both sides, depending upon sign type.
 - b. Shall be convertible in field to allow for connection to other Rail Back panels, so that additive changes can be made to sign unit.

- c. Rail shall allow for a variety of mounting devices including wall mounting for screw-on applications, using pressure sensitive tape, freestanding mount, ceiling mount and other mounting devices as needed.
- 4. Rail Insert functions as a mounting device for Copy Panels on to the Rail Back. The Rail Insert mounts to the back of the Copy Panel with adhesive suitable for use with the particular copy insert material.
 - a. Shall allow Copy Panels to slide or snap into the horizontal Rail Back for ease of changeability.
 - b. Shall mount to the back of the Copy Panel with adhesive suitable for use with particular Copy Panel material.
- 5. Copy Panels shall accept various forms of copy and graphics, and attaches to the Rail Back with the Rail Insert. Copy Panels shall be either ABS plastic with integral color or an acrylic lacquer finish; photo polymer; or, acrylic.
 - a. Interchangeable by sliding horizontally from either side of sign, and to other signs in system of equal or greater width or height.
 - b. Cleanable without use of special chemicals or cleaning solutions.
 - c. Copy Insert Materials.
 - 1) ABS Inserts - 2.3 mm (.090 inches) extruded ABS plastic core with .07 mm (.003 inches) acrylic cap bonded during extrusion/texturing process. Pressure bonded to extruded Rail Insert using adhesive. Background color is either integral or painted in acrylic lacquer. ABS inserts finished in a chromium industries #HM335RA texture pattern to prevent glare.
 - 2) Photo polymer Inserts - 3 mm (.125 inches) phenolic photo polymer with raised copy etched to 2.3 mm (.0937 inches), bonded to an ABS plastic or extruded aluminum insert with adhesive. Background color is painted in acrylic enamel.
 - 3) Changeable Paper/ Insert Holder - Extruded insert holder with integral Rail Insert for connection with structural back panel in 6063T5 aluminum with a black anodized finish. Inserts into holder are paper with a clear 0.7 mm (.030 inches) textured cover. Background color is painted in acrylic lacquer.
 - 4) Acrylic - 2 mm (.080 inches) non-glare acrylic. Pressure bonded to extruded Rail Insert using adhesive. Background color is painted in acrylic lacquer or acrylic enamel.
 - 5) Extruded 6063T5 aluminum with a black anodized finish Insert Holder with integral Rail Insert for connection with Structural Back Panel to hold a 0.7 mm (.030 inches) textured

polycarbonate insert and a Sliding Tile which mounts in the Inset Holder and slides horizontally.

- 6) End Caps - Extruded using 6063T5 aluminum with a black anodized. End Caps interlock with Rail Back with clips to form an integral unit, enclosing and securing the changeable Copy Panels, without requiring tools for assembly.
 - a) Shall be interchangeable to either end of sign and to other signs in the system of equal height.
 - b) Mechanical fasteners can be added to the End Caps that will secure it to Rail Back to make sign tamper resistant.
- 7) Joiners - Extruded using 6063T5 aluminum with a black anodized finish. Rail Joiners connect Rail Backs together blindly, providing a butt joint between Copy Inserts.
- 8) Accent Joiners - Extruded using 6063T5 aluminum with a mirror polished finish. Joiner shall connect Rail Backs together with a visible 3 mm (.125 inches) horizontal rib, flush to the adjacent Copy Panel surfaces.
- 9) Top Accent Rail - Extruded using 6063T5 aluminum with a mirror polished finish. Rail shall provide 3 mm (.125 inches) high decorative trim cap, which butts flush to adjacent Copy Panel and encloses top of Rail Back and Copy Panel.
- 10) Typography
 - a) Vinyl First Surface Copy (non-tactile) - Applied Vinyl copy.
 - b) Subsurface Copy Inserts - Textured 1 mm (.030 inches) clear polycarbonate face with subsurface applied Vinyl copy. Face shall be back sprayed with paint and laminated to an extruded aluminum carrier insert.
 - c) Integral Tactile Copy Inserts - phenolic photo polymer etched with 2.3 mm (.0937 inches) raised copy.
 - d) Silk-screened First Surface Copy (non-tactile) - Injection molded or extruded ABS plastic or aluminum insert with first surface applied enamel silk-screened copy.

C. Sign Type Family 01, 02.01 thru 02.05, 08, 09 and 20:

1. All text and graphics are to be first surface silk-screened.
2. IN-01.12 & IN-01.13: Refer to Sign Type 03 specification for tactile and Braille portion of sign.
3. IN-02.4: All text and graphics are to be first surface vinyl letters.
4. IN-01.1: Preparation of artwork for reproduction of "fire and emergency evacuation maps" is by manufacturer.

D. Sign Type Families 03:

1. Tactile sign is to be made from a material that provides for letters, numbers and Braille to be integral with sign plaque material such as: photosensitive polyamide resin, etched metal, sandblasted phenolic or embossed material. Do not apply letters, numbers and Braille with adhesive.
 2. Numbers, letters and Braille to be raised 0.793 mm (.0312 inches) from the background surface. The draft of the letters, numbers and Braille to be tapered, vertical and clean.
 3. Braille dots are to conform with standard dimensions for literary Braille; (a) Dot base diameter: 1.5 mm (.059 inches) (b) Inter-dot spacing: 2.3 mm (.090 inches) (c) Horizontal separation between cells: 6.0 mm (.241 inches) (d) Vertical separation between cells: 10.0 mm (.395 inches)
 4. Entire assembly is painted in specified color. After painting, apply white or other specified color to surface of the numbers and letters. Entire sign is to have a protective clear coat sealant applied.
 5. Complete sign is to have an eggshell finish (11 to 19 degree on a 60 degree glossmeter).
- E. Sign Type Family 04 and 11:
1. All text and graphics are to be first surface applied vinyl letters.
 2. IN-04: When a Type IN-04 is to be mounted under a Type IN03, a connecting Accent Joiner is to be used to create a singular integrated sign.
- F. Sign Type 05:
1. Text if added to Copy Insert module to be first surface applied vinyl letters.
- G. Sign Type Family 06 and 07:
1. All text and graphics are to be first surface applied vinyl letters except for under sliding tile.
 2. Protect text, which is covered by sliding tile, so tile does not wear away letters.
- H. Sign Type Family 10:
1. Pocket depth is to be 0.3 mm (.0150 inches).
- I. Sign Type Family 12 and 13:
1. All text and graphics are to be first surface applied vinyl letters.
 2. IN-12: Provide felt, cork or similar material on bottom of desk mounting bracket to protect counter surfaces.
- J. Sign Type Family 14, 15, and 16:
1. All text and graphics are to be first surface applied vinyl letters.

2. IN-14.06: When added to top of IN-14.01, IN-14.04, or IN-14.05 a connecting Accent Joiner is to be used to create a singular integrated sign.
3. Ceiling mounted signs required mounting hardware on the sign that allows for sign disconnection, removal and reinstallation and reconnection.

K. Sign Type Family 17:

1. All text and graphics are to be first surface applied vinyl letters.
2. IN-17: Directory constructed using elements of the Component System.

L. Sign Type Family 18:

1. All text and graphics are to be first surface applied stylus cut vinyl letters.
2. Provide in specified typeface, color and spacing, with each message or message group on a single quick release backing sheet.

M. Sign Type Family 19:

1. Dimensional letters are mill or laser cut acrylic in the size and thickness noted in the drawings.
2. Draft of letters is perpendicular to letters face.
3. All corners such as where a letter stem and bar intersect are to be square so the letter form is accurately reproduced.
4. Paint letters with acrylic polyurethane in specified color and finish.

N. Sign Type Family (See Specialty Signs Section) 21:

1. IN-21.01: 57 mm (2.25 inches) polished aluminum tube mounted to weighted 356 mm (14 inches) diameter polished aluminum base. Sign bracket to hold a 6 mm (.25 inches) sign plaque.
2. IN-21.02: 57 mm (2.25 inches) polished aluminum tube vertical support mounted to a weighted polished 57 mm (2.25 inches) aluminum tubular base. Rail Back mechanically connected to vertical supports with Copy Panel attached to front and back.
3. IN-21.03 & 21.04: IN-21.02: 57 mm (2.25 inches) polished aluminum tube vertical support mounted to a weighted polished 57 mm (2.25 inches) aluminum tubular base. Rail Back mechanically connected to vertical supports with hinged locking glass door. Black felt covered changeable letter board or tan vinyl impregnated cork tack surface as background within case.

O. Sign Type Family 22:

1. IN-22.01: Extruded aluminum clip anodized black containing rollers to pinch and release paper. End caps are black plastic.

2. IN-22.02: Patient Information holder constructed of 18 gauge formed sheet metal painted in specified color. Polished aluminum connecting rods and buttons. Button covers for mounting screws are to permanently attach and securely conceal screws.

P. Temporary Interior Signs:

1. Fabricated from 50 kg (110 pound) matte finished white paper cut to 100 mm (4 inch) wide by 300 mm (12 inch) long. Punched 3 mm (.125 inch) hole with edge of hole spaced 13 mm (.5 inch) in from edge and centered on 100 mm (4 inch) side. Reinforce hole on both sides with suitable material that prevents tie from pulling through hole. Ties are steel wire 0.3 mm (0.120 inch) thick attached to tag with twist leaving 150 mm (6 inch) long free ends.
2. Mark architectural room number on sign, with broad felt marker in clearly legible numbers or letters that identify room, corridor or space as shown on floor plans.
3. Install temporary signs to all rooms that have a room, corridor or space number. Attach to door frame, door knob or door pull.
 - a. Doors that do not require signs are: corridor doors in corridor with same number, folding doors or partitions, toilet doors, bathroom doors within and between rooms, closet doors within rooms, communicating doors in partitions between rooms with corridor entrance doors.
 - b. Replace and missing damaged or illegible signs.

2.5 FABRICATION

- A. Design components to allow for expansion and contraction for a minimum material temperature range of 56 °C (100 °F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
- B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever and wherever possible.
- C. Shop fabricate so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.
- D. Contact surfaces of connected members be true. Assembled so joints will be tight and practically unnoticeable, without use of filling compound.
- E. Signs shall have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces be smooth flat and without oil-canning, free of rack and twist. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches). Restore texture to filed or cut areas.

- F. Level or straighten wrought work. Members shall have sharp lines and angles and smooth surfaces.
- G. Extruded members to be free from extrusion marks. Square turns and corners sharp, curves true.
- H. Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.
- I. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Edge joints tightly mitered to give appearance of solid material.
- J. All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.
- K. Movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of members. Doors and covers centered in opening or frame. All contact surfaces fit tight and even without forcing or warping components.
- L. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- M. No signs are to be manufactured until final sign message schedule and location review has been completed by the Resident Engineer & forwarded to contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Protect products against damage during field handling and installation. Protect adjacent existing and newly placed construction, landscaping and finishes as necessary to prevent damage during installation. Paint and touch up any exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- B. Mount signs in proper alignment, level and plumb according to the sign location plan and the dimensions given on elevation and sign location drawings. Where otherwise not dimensioned, signs shall be installed where best suited to provide a consistent appearance throughout the project. When exact position, angle, height or location is in doubt, contact Resident Engineer for clarification.

- C. Contractor shall be responsible for all signs that are damaged, lost or stolen while materials are on the job site and up until the completion and final acceptance of the job.
- D. Remove or correct signs or installation work Resident Engineer determines as unsafe or as an unsafe condition.
- E. At completion of sign installation, clean exposed sign surfaces. Clean and repair any adjoining surfaces and landscaping that became soiled or damaged as a result of installation of signs.
- F. Locate signs as shown on the Sign Location Plans.
- G. Certain signs may be installed on glass. A blank glass back up is required to be placed on opposite side of glass exactly behind sign being installed. This blank glass back up is to be the same size as sign being installed.
- H. Contractor will be responsible for verifying that behind each sign location there are no utility lines that will be affected by installation of signs. Any damage during installation of signs to utilities will be the sole responsibility of the Contractor to correct and repair.
- I. Furnish inserts and anchoring devices which must be set in concrete or other material for installation of signs. Provide setting drawings, templates, instructions and directions for installation of anchorage devices which may involve other trades.

- - - 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. 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.
- C. Shop Drawings: Showing layout of tracks and method of anchorage.
- D. Manufacturer's Literature and Data:
1. Cubicle curtain track.

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.
- 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):
- B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
- B456-03(R2009).....Electrodeposited Coatings for Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
- 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.
- 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 (onefoot) 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.

2.3 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).
- C. Metal Clips: Anchor curtain tracks to exposed grid of lay-in acoustical tile ceilings, with concealed metal (butterfly) type or two piece snap locking type ceiling clip of high strength spring steel. When it is not possible to install the metal ceiling clip, the cubicle curtain track may be screwed to the ceiling grid.

2.4 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.

- B. Chrome/Nickel Plating: Satin or polished finish as specified, ASTM B546, minimum thickness of chromium plate as follows:
 - 1. 0.2 mil on copper alloys.
 - 2. 0.4 mil on steel.
- C. Stainless Steel: No. 4 in accordance with NAAMM Metal Finishes Manual.

2.5 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. Securely fasten end stop caps to prevent their being forced out by the striking weight of carriers.
- F. 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.

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SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies wall guards (crash rails or bumper guards), handrail/wall guard combinations and corner guards. and high impact wall covering.

1.2 RELATED WORK

- A. Armor plates and kick plates not specified in this section: Section 08 71 00, DOOR HARDWARE.
- B. Color and texture of aluminum and resilient material: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Show design and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Handrail/Wall Guard Combinations.
 - 2. Wall Guards.
 - 3. Corner Guards.
 - 4. High Impact Wall covering
- D. Test Report: Showing that resilient material complies with specified fire and safety code requirements.
- E. LEED:
 - 1. Product data for Credit IEQ 4.1. For adhesives, documentation including printed statement of VOC content.

1.4 DELIVERY AND STORAGE

- A. Deliver materials to the site in original sealed packages or containers marked with the name and brand, or trademark of the manufacturer.
- B. Protect from damage from handling and construction operations before, during and after installation.
- C. Store in a dry environment of approximately 21° C (70 degrees F) for at least 48 hours prior to installation.

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):
- A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel
Steel Plate, Sheet, and Strip
 - B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods,
Wire, Shapes, and Tubes
 - D256-06.....Impact Resistance of Plastics
 - D635-06.....Rate of Burning and/or Extent and Time of
Burning of Self-Supporting Plastics in a
Horizontal Position
 - E84-09.....Surface Burning Characteristics of Building
Materials
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500-06.....Metal Finishes Manual
- D. National Fire Protection Association (NFPA):
- 80-10.....Standard for Fire Doors and Windows
- E. Society of American Automotive Engineers (SAE):
- J 1545-05.....Instrumental Color Difference Measurement for
Exterior Finishes.
- F. Underwriters Laboratories Inc. (UL):
- Annual Issue.....Building Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A167, Type 302B.
- B. Aluminum Extruded: ASTM B221, Alloy 6063, Temper T5 or T6.
- C. Resilient Material:
 - 1. Extruded and injection molded acrylic vinyl or extruded polyvinyl chloride meeting following requirements:
 - a. Minimum impact resistance of 1197 ps (25 ft lbs per sq.ft) when tested in accordance with ASTM D256 (Izod impact, ft.lbs. per inch notch).
 - b. Class 1 fire rating when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less.
 - c. Rated self extinguishing when tested in accordance with ASTM D635.
 - d. Material shall be labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.
 - e. Integral color with all colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.
 - f. Same finish on exposed surfaces.

2.2 CORNER GUARDS

- A. Resilient, Shock-Absorbing Corner Guards: Surface mounted 6 mm 1/4-inch corner) to match existing.
1. Snap-on corner guard formed from resilient material, minimum 2 mm (0.078-inch) thick, free floating on a continuous 1.6 mm (0.063-inch) thick extruded aluminum retainer.
 2. Provide appropriate mounting hardware, cushions and base plates as required.
 3. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.
 4. Flush mounted corner guards installed on any fire rated wall shall maintain the fire rating of the wall. Provide fire test of proposed corner guard system to verify compliance.
 - a. Where insulating materials are an integral part of the corner guard system, the insulating materials shall be provided by the manufacturer of the corner guard system.
 - b. All exposed metal in fire rated assemblies shall have a paintable finish.
- B. Stainless Steel Corner Guards: Fabricate of 1.6 mm (0.0625-inch) thick stainless steel. Form guards of dimensions and to contour shown.

2.3 WALL GUARDS AND HANDRAILS

- A. Resilient Wall Guards and Handrails:
1. Handrail/Wall Guard Combination: Snap-on covers of resilient material, minimum 2 mm (0.078-inch) thick, shall be free-floated on a continuous, extruded aluminum retainer, minimum 1.8 mm (0.072-inch) thick, anchored to wall at maximum 760 mm (30 inches) on center.
 2. Wall Guards (Crash Rails): Snap-on covers of resilient material, minimum 2.8 mm (0.110-inch) thick, shall be free-floated over 50 mm (two-inch) wide aluminum retainer clips, minimum 2.3 mm (0.090-inch) thick, anchored to wall at maximum 600 mm (24 inches) on center, supporting a continuous aluminum retainer, minimum 1.6 mm (0.062-inch) thick; or, shall be free-floated over a continuous extruded aluminum retainer, minimum 2.3 (0.090-inch) thick anchored to wall at maximum 600 mm (24 inches) on center.
 3. Provide handrails and wall guards (crash rails) with prefabricated and closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories as required. End caps and corners shall be field adjustable to assure close alignment with handrails and wall guards (crash rails). Screw or bolt closure caps to aluminum retainer.

2.4 HIGH IMPACT WALL COVERING

- A. Fabricate from vinyl acrylic or polyvinyl chloride resilient material minimum 6mm (0.06 inch) thick designed specially for interior use.
- B. Coordinate with door, and guard rail, protection material and supplier for proper fit, installation and color.
- C. Provide adhesive as recommended by the wall covering manufacturer.

2.5 FASTENERS AND ANCHORS

- A. Provide fasteners and anchors as required for each specific type of installation.
- B. Where type, size, spacing or method of fastening is not shown or specified, submit shop drawings showing proposed installation details.

2.6 FINISH

- A. In accordance with NAAMM AMP 500 series.
- B. Resilient Material: Embossed texture and color in accordance with SAE J 1545 and as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - INSTALLATION

3.1 RESILIENT CORNER GUARDS

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. 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 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 STAINLESS STEEL WALL GUARDS

- A. Space brackets at not more than three feet on centers and anchor to the wall in accordance with manufacturer's installation instructions.

3.5 DOOR, DOOR FRAME PROTECTION AND HIGH IMPACT WALL COVERING

- A. Surfaces to receive protection shall be clean, smooth and free of obstructions.
- B. Apply with adhesive in controlled environment according to manufacture's recommendations.
- C. 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.

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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. Items Specified:
 - 1. Paper towel dispenser.
 - 2. Combination paper towel dispenser and disposal unit.
 - 3. Waste receptacles.
 - 4. Toilet tissue dispenser.
 - 5. Grab Bars.
 - 6. Clothes hooks, robe or coat.
 - 7. Towel bars.
 - 8. Metal framed mirror.
 - 9. Foot operated soap dispenser.
 - 10. Soap dishes.
 - 11. Mop racks.
 - 12. Wall mounted bench

1.2 RELATED WORK

- A. Color of finishes: Section 09 06 00, SCHEDULE FOR FINISHES
- B. Ceramic toilet and bath accessories: Section 09 30 13, CERAMIC/PORCELAIN TILE
- C. Shower curtain break away pendant chain hooks: Section 10 21 23, CUBICLES.
- D. Color of vinyl fabric: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Manufactured toilet and bath accessories: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Each product specified.
 - 2. Paper towel dispenser and combination dispenser and disposal units.
 - 3. Metal framed mirrors, showing shelf where required, fillers, and design and installation of units when installed on ceramic tile wainscots and offset surfaces.
 - 4. Grab bars, showing design and each different type of anchorage.
 - 5. Foot operated soap dispenser, showing anchorage and components.

6. 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, Phisoex 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.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.5 PACKAGING AND DELIVERY

- A. Pack accessories individually to protect finish.
- B. Deliver accessories to the project only when installation work in rooms is ready to receive them.
- C. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- D. Deliver products to site in sealed packages of containers; labeled for identification with manufacturer's name, brand, and contents.

1.6 STORAGE

- A. Store products in weathertight and dry storage facility.

- B. Protect from damage from handling, weather and construction operations before, during and after installation in accordance with manufacturer's instructions.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
- A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 - A176-99(R2009).....Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
 - A269-10.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service
 - A312/A312M-09.....Seamless and Welded Austenitic Stainless Steel Pipes
 - A653/A653M-10.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - B456-03(R2009).....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
 - C1036-06.....Flat Glass
 - C1048-04.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass
 - D635-10.....Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position
 - F446-85(R2009).....Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.
 - D3453-07.....Flexible Cellular Materials - Urethane for Furniture and Automotive Cushioning, Bedding, and Similar Applications
 - D3690-02(R2009).....Vinyl-Coated and Urethane-Coated Upholstery Fabrics
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500 Series.....Metal Finishes Manual
- D. American Welding Society (AWS):

D10.4-86 (R2000).....Welding Austenitic Chromium-Nickel Stainless
Steel Piping and Tubing

E. Federal Specifications (Fed. Specs.):

A-A-3002.....Mirrors, Glass

FF-S-107C (2).....Screw, Tapping and Drive

FF-S-107C.....Screw, Tapping and Drive.

WW-P-541E(1).....Plumbing Fixtures (Accessories, Land Use) Detail
Specification

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM B221, alloy 6063-T5 and alloy 6463-T5.

B. 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.

C. Stainless Steel Tubing: ASTM A269, Grade 304 or 304L, seamless or
welded.

D. Stainless Steel Pipe: ASTM A312; Grade TP 304 or TP 304L.

E. Steel Sheet: ASTM A653, zinc-coated (galvanized) coating designation
G90.

F. Glass:

1. ASTM C1036, Type 1, Class 1, Quality q2, for mirrors.

G. Foam Rubber: ASTM D3453, Grade BD, Type 2.

H. Vinyl Covering: ASTM D3690, Vinyl coated fabric, Class A.

I. Plywood: PS1, Grade CD.

2.2 FASTENERS

A. Exposed Fasteners: Stainless steel or chromium plated brass, finish to
match adjacent surface.

B. Concealed Fasteners: Steel, hot-dip galvanized (except in high moisture
areas such as showers or bath tubs use stainless steel).

C. Toggle Bolts: For use in hollow masonry or frame construction.

D. Hex bolts: For through bolting on thin panels.

E. Expansion Shields: Lead or plastic as recommended by accessory
manufacturer for component and substrate for use in solid masonry or
concrete.

F. Screws:

1. ASME B18.6.4.

2. Fed Spec. FF-S-107, Stainless steel Type A.

G. 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.
- C. AA-M32 Mechanical finish, medium satin.
 - 1. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.
 - 2. Stainless Steel: NAAMM AMP 503, finish number 4.
 - 3. Ferrous Metal:
 - a. Shop Prime: Clean, pretreat and apply one coat of primer and bake.
 - b. Finish: Over primer apply two coats of alkyd or phenolic resin enamel, and bake.
 - 4. Nylon Coated Steel: Nylon coating powder formulated for a fluidized bonding process to steel to provide a hard smooth, medium gloss finish, not less than 0.3 mm (0.012-inch) thick, rated as self-extinguishing when tested in accordance with ASTM D635.

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, 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 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.

2.7 TOILET TISSUE DISPENSERS

- A. Double roll surface mounted type.
- B. Mount on continuous backplate.
- C. Removable spindle ABS plastic or chrome plated plastic.
- D. Wood rollers are not acceptable.

2.8 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 use only one type throughout the project:
 - 1. Stainless steel: Grab bars, flanges, mounting plates, supports, screws, bolts, and exposed nuts and washers.
- 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. Flange for Exposed Mounting:

1. Minimum 5 mm (3/16 inch) thick, approximately 75 mm (3 inch) diameter.
2. Insert grab bar through flange and continuously weld perimeter of grab bar flush to backside of flange.
3. Where mounted on metal toilet partitions or tile wall, provide three equally spaced, countersunk holes, sized to accommodate 5 mm (3/16 inch) diameter bolts.
4. Where mounted on floor, provide four equally spaced holes, sized to accommodate 5 mm (3/8 inch) diameter bolts, not more than 5 mm (3/8 inch) from edge of flange.

G. 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.

H. Back Plates:

1. Minimum 2.65 mm (0.1046 inch) thick metal.
2. Fabricate in one piece, approximately 6 mm (1/4 inch) deep, with diameter sized to fit flange. Provide slotted holes to accommodate anchor bolts.
3. Furnish spreaders, through bolt fasteners, and cap nuts, where grab bars are mounted on metal toilet partitions and tile walls.

2.9 CLOTHES HOOKS-ROBE OR COAT

- A. Fabricate hook units either of chromium plated brass with a satin finish, or stainless steel, using 6 mm (1/4 inch) minimum thick stock, with edges and corners rounded smooth to the thickness of the metal, or 3 mm (1/8 inch) minimum radius.
- B. Fabricate each unit as a double hook on a single shaft, integral with or permanently fastened to the wall flange, provided with concealed fastenings.

2.10 TOWEL BARS

- A. Fed. Spec. WW-P-541/8B, Type IV, Bar, Surface mounted; Class 1, towel.
- B. Either stainless steel, or chromium plated copper alloy.
- C. Bar Length: 450 and 600 mm (18 and 24 inches) as shown.
- D. Finish of brackets or supports same as bar.

2.11 METAL FRAMED MIRRORS

- A. Fed. Spec. A-A-3002 metal frame; anodized aluminum
- B. Mirror Glass:
 1. Minimum 6 mm (1/4 inch) thick.

2. Set mirror in a protective vinyl glazing tape.

C. Frames:

1. Channel or angle shaped section with face of frame 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.

E. Mounting Bracket:

1. Designed to support mirror tight to wall.
2. Designed to retain mirror with concealed set screw fastenings.

2.12 FOOT OPERATED SOAP DISPENSER

- A. Wall mounted, liquid soap dispenser, designed with an adjustable needle valve to allow dispensing of two milliliters of liquid with each depression of foot pump.

- B. Connect foot pump, by a 1800 mm (6 foot) air tube, to a 1 liter (30 ounce) liquid container. Provide air intake tube with a special feature to prevent liquid from dripping after release of pedal.
- C. Operate pump by a slip resistant, rubber padded, pedal.
- D. Complete unit shall not be adversely affected by the liquid soap, aseptic detergent, or hexachlorophene solutions.
- E. Provide a removable gummed label, attached to container, stating that soap or detergent may be used in the dispensers.

2.13 SOAP DISHES

- A. Fed. Spec. WW-P-541/8B, Type VI, Holder.
- B. Class 1, Surface Mounted:
 - 1. One piece with provisions for exposed fasteners.
 - 2. Fabricate from chromium plated brass approximately 115 by 95 mm (4 1/2 by 3-3/4 inches) overall size with drainage openings at bottom.

2.14 MOP RACKS

- A. Minimum 1.0M (40 inches) long with five holders.
- B. Clamps:
 - 1. Minimum of 1.3 mm (0.050-inch) thick stainless steel bracket retaining channel with a hard rubber serrated cam; pivot mounted to channel.
 - 2. Clamps to hold handles from 13 mm (1/2-inch) minimum to 32 mm (1-1/4 inch) maximum diameter.
- C. Support:
 - 1. Minimum of 1 mm (0.0375 inch) thick stainless steel hat shape channel to hold clamps away from wall as shown.
 - 2. Drill wall flange for 3 mm (1/8 inch) fasteners above and below clamp locations.
- D. Secure clamps to support with oval head machine screws or rivets into continuous reinforcing back of clamps.
- E. Finish on stainless Steel: AMP 503-No. 4.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before starting work notify Resident Engineer in writing of any conflicts detrimental to installation or operation of units.
- B. Verify with the Resident Engineer 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.
- C. Install accessories in accordance with the manufacturer's printed instructions and ASTM F446.
- D. Install accessories plumb and level and securely anchor to substrate.
- E. Install accessories in a manner that will permit the accessory to function as designed and allow for servicing as required without hampering or hindering the performance of other devices.
- F. Position and install dispensers, and other devices in countertops, clear of drawers, permitting ample clearance below countertop between devices, and ready access for maintenance as needed.
- G. Align mirrors, dispensers and other accessories even and level, when installed in battery.
- H. Install accessories to prevent striking by other moving, items or interference with accessibility.

3.3 CLEANING

After installation, clean as recommended by the manufacturer and protect from damage until completion of the project.

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SECTION 10 44 13
FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. 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

- A. 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 aluminum 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
 - 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 clear satin anodized aluminum.

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 975 mm (39 inches) above finished floor.

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SECTION 10 51 24
FLOOR OR BASE MOUNTED LOCKERS, PHENOLIC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes solid phenolic lockers.
- B. Phenolic Lockers work includes the following:
 - 1. Lockers Compartments (various sizes, styles, and tier configuration)
- C. Component Accessories
 - 1. Slope Tops
 - 2. Filler Kits
 - 3. Trim Kits for recessed installations
 - 4. Bases (Polyethylene)
 - 5. Locking Device Options
 - 6. Hooks, Coat Rod Hooks, Coat Rods
 - 7. Number Plates
 - 8. Furnish all labor and materials necessary for the completion of work in this section as shown on the contract drawings and specified herein

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of solid phenolic locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker.
- B. Shop Drawings: For solid phenolic lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show details full size.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 4. Show locations and sizes of cutouts and holes for items installed in lockers.
 - 5. Show locker fillers, trim, base, sloping tops, and accessories.
 - 6. Show locker numbering sequence.

C. Samples for Initial Selection:

1. Colors (Doors and End Cover Panels only) shall be selected from the manufacturer's standard range of colors.
2. Color and hardware samples shall be submitted for approval to the architect.

D. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
3. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
4. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Full-size units of the following locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
 - a. Hinges.
 - b. Pulls.

1.6 STORAGE AND HANDLING

- A. Do not deliver lockers until painting and similar operations that could damage lockers have been completed in installation areas. If lockers must be stored in other-than-installation areas, store only in areas where environmental conditions are the same as those in final installation location, and comply with requirements specified in "Field Conditions" Article.

B. Deliver master and control keys to Owner.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install lockers until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where lockers 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 the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support lockers by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where lockers are indicated to fit to other construction, establish dimensions for areas where lockers are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of concealed support bases.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that lockers can be supported and installed as indicated.
- C. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087100 "Door Hardware" to fabricator of lockers; coordinate Shop Drawings and fabrication with hardware requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of lockers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of locks or hardware.
 - c. Deterioration of materials beyond normal use.
 - d. Delamination, breakage or corrosion.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities, the Architectural barriers Act Accessibility Standard (ABAAS) and the Department of Veterans Affairs Barrier Free Design Guide PG-18-13.
- B. Solid Phenolic Lockers
- C. Basis-of-Design Product: Subject to compliance with requirements, provide Solid Phenolic Lockers, by ASI Storage Solutions, Inc. or a comparable product by another manufacturer.
 - 1. Lockers shall be Two Person, Z-Lockers as shown on drawings. Units shall be 15" wide x 18" deep. Standard height = 72". Base height = 4". Provide 6" high sloping top.
- D. Construction Style: Flush overlay.
- E. Doors shall be fitted with a flush mount handle, number plate, padlock hasp, and optional locking device.
- F. Doors shall be mounted to Side Panel using Stainless Steel Piano Type hinge and Stainless Steel Fasteners.
- G. Door edges shall be brushed and beveled.
- H. Side Panels, Tops, Bottoms, Shelves, shall be attached by stainless steel fasteners and stainless steel brackets. Exposed edges shall be brushed and beveled.
- I. Color selection is allowed for Doors and End Cover Panels only; all other components are speckle tone. The texture is Matte finish.
- J. Bases are standard Black Polyethylene material. Base kit furnished unassembled with anchoring and assembly hardware.
- K. Concealed interior ventilation.

2.2 MATERIALS

- A. Phenolic Locker Component Panels shall be constructed of solid phenolic core decorative plastic laminate with multiple resin impregnated kraft and surface sheets fused at high temperature and pressure.
 - 1. Doors shall be of 1/2" thickness, Standard manufacturer's range of colors available.
 - 2. Side Panels and Back Panels shall be of 3/8" thickness. Standard speckle tone color supplied.
 - 3. Tops, Bottoms, and Shelves shall be constructed of 1/2" thickness. Standard speckle tone color supplied.

4. End Cover Panels shall be of 1/2" thickness, Standard manufacturer's colors available.
 5. Slope Top, Filler, and Trim Kits shall be of 1/2" thickness. Standard manufacturer's colors available.
 6. Bases are Standard Black Polyethylene material. Size is 1" X 4" X 72". Installer cuts to fit at site.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Recycled content of 5% preconsumer, 10% post-consumer, steel hardware 60%.
- D. Use FSC, COC sheets.

2.3 HARDWARE

- A. General: Provide manufacturer's standard locker hardware complying with the requirements in this Section.
- B. All Hinges shall be of Stainless Steel with Black Powder Coat Finish.
- C. Door Latches shall be mounted at the mid-point of each door. Handles will not require more than 5 lbs. actuation force, and shall be capable of release from the inside of the locker.
- D. Padlock Hasps shall be mounted below each handle and will accept standard padlock styles.
- E. Fasteners shall be of stainless steel; door hinges and latches, and handles will be mounted with rivets, and /or, machine screws. Hooks and Number Plates will be mounted with rivets.
- F. End Cover Panels will be mounted with Stainless Steel through bolts.
- G. Locker Units can be banked together with Stainless Steel through bolts.
- H. All brackets shall be stainless steel Type 304.
- I. ACCESSORIES
- J. Mirrors: ASTM C 1036, Type I, Class 1, Quality q2; with second (back) surface coated with successive layers of chemically deposited silver, copper, and protective organic coating to produce coating system complying with performance requirements in ASTM C 1503 for mirror quality glazing.
1. Glass Thickness: 5 mm minimum unless otherwise indicated.
 2. Frame: Phenolic.
- K. Number Plates: 1-1/2-inch- (38-mm-) diameter, etched, embossed, or stamped, aluminum plates with black numbers and letters at least 1/2

inch (13 mm) high. Identify lockers in sequence. Finish plates to match other locker hardware.

2.4 FABRICATION

- A. Fabricate each locker with shelves, an individual door and frame, an individual top, a bottom, and a back, and with common intermediate uprights separating compartments.
 - 1. Fabricate lockers to dimensions, profiles, and details indicated.
 - 2. Ease edges of corners of phenolic members to 1/16-inch (1.5-mm) radius.
- B. Fabricate components square, rigid, without warp, and with finished faces flat and free of scratches and chips. Accurately factory machine components for attachments. Make joints tight and true.
 - 1. Fabricate lockers using manufacturer's standard construction, with joints made with dowels, dados, or rabbets. Dado side panels to receive shelving except where indicated to be adjustable.
- C. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.
- D. Number Plates: Inlay number plates flush in each locker door, near top, centered.
- E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- F. Shop cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- G. Attach PVC edging to panels by thermally fusing edging to panels after panel fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that furring is attached to concrete and masonry walls that are to receive lockers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Condition lockers to average prevailing humidity conditions in installation areas before installation.
- B. Before installing lockers, examine factory-fabricated work for completeness and complete work as required, including removal of packing.

3.3 INSTALLATION

- A. Install support base with 1/2-inch- (13-mm-) thick plywood top.
- B. Assemble knocked-down lockers with manufacturer's standard fasteners, with no exposed fasteners on face frames.
- C. Install lockers level, plumb, and true; use concealed shims.
- D. Connect groups of lockers together with manufacturer's standard fasteners, through predrilled holes, with no exposed fasteners on face frames. Fit lockers accurately together to form flush, tight, hairline joints.
- E. Install lockers without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings, providing unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Installation Tolerance: No more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line. Shim as required with concealed shims.
- F. Locker Anchorage: Fasten lockers through back, near top and bottom, at ends with No. 8 pan-head sheet metal screws through metal backing or metal framing behind wall finish and spaced not more than 16 inches (400 mm) o.c.
- G. Scribe and cut corner and filler panels to fit adjoining work using fasteners concealed where practical. Repair damaged finish at cuts.
- H. Attach sloping-top units to lockers, with end panels covering exposed ends.

I. Install number plates after lockers are in place.

1. Attach number plate on each locker door, near top, centered, with at least two screws with finish matching number plate.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer

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SECTION 11 73 00
CEILING MOUNTED PATIENT LIFT SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. 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

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
 - 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.

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

PART 2 - PRODUCTS

2.1 CEILING TRACK SYSTEM

- A. 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.

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: 440 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.
- 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

- A. Training shall be provided for the required personnel to educate them on proper operation and maintenance for the lift system equipment.

3.3 TEST

- A. Conduct performance test, in the presence of the Resident Engineer 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.

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SECTION 12 24 00
WINDOW SHADES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Interior electrically-operated roller shades and control systems are specified in this section. Window shades shall be furnished complete, including brackets, fittings, hardware, control systems and electronic drive units.

1.2 RELATED WORK

- A. Color of roller shade material: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Coordination with gypsum board assemblies: Section 09 29 00 GYPSUM BOARD
- C. Coordination with acoustical ceiling: Section 09 51 00 ACOUSTICAL CEILINGS
- D. Coordination with electrical service: DIV 26 ELECTRICAL

1.3 QUALITY CONTROL

- A. Manufacturer's Qualification: Roller Shade manufacturer shall provide evidence that the manufacture of blinds and controls are a major product, and that the blinds have performed satisfactorily on similar installations.
- B. Provide shades with products passing flame resistance testing according to NFPA 701
- C. Electrical Components: NFPA Article 100 listed and labeled by UL or ETL, marked for intended use, and tested as a system. Where applicable, system components shall be FCC compliant.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. Roller shade cloth, each type, 600 mm (24 inch) square showing color, finish and texture.
- C. Manufacturer's literature and data; showing details of construction, coordination and hardware for:
Electrically-operated roller shades, control systems and electronic drive units.
- D. Maintenance Data: methods for maintaining roller shades, precautions regarding cleaning materials, instructions for operating hardware and controls.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced to in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
 - AA-V-00200B.....Venetian Blinds, Shade, Roller, Window, Roller, Slat, Cord, and Accessories
- C. American Society for Testing and Materials (ASTM):
 - A167-99(R2009).....Stainless and heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - B221/B221M-08.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - D635-10.....Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
 - D648-07.....Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
 - D1784-08.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Motorized vertical roll-up non-pvc cloth fabric, window shade with controls, mounting brackets and other components necessary for complete installation.
- B. Operation: Shade Motor and Control System to include a quiet motor system that makes no audible clicks when motor stops or stops. Motor to be concealed. Individual and group control to operate shades as group or individually with preset stopping locations.
- C. Roller: Fabricated from extruded aluminum or steel. Diameter and material by manufacturer to accommodate shade size and existing conditions. Fabric connected to the roller tube to eliminate horizontal impressions on fabric. Shade slat to be encased in heat sealed hem.
- D. Mounting to be in shade pocket design for recessed ceiling installation of window shades. Provide light gap reduction.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not begin installation until substrates have been properly prepped.

- B. Coordinate requirement for blocking and structural supports to ensure adequate means for installation of window shades.
- C. Install shades level and plumb and aligned with adjacent units according to manufacturer's written instructions.
- D. Test motorized window shades to verify that controls, limit switches, interface to other building systems and other operating components are functional.

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SECTION 12 32 00
MANUFACTURED WOOD CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies 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. Base cabinets as shown on drawings.
 - 2. Cabinets and counters as shown on drawings
 - 3. Plastic laminate covered countertops for casework as shown on drawings.

1.2 RELATED WORK

- A. Custom Casework: Section 06 20 00, FINISH CARPENTRY.
- B. Color and Finish of Plastic Laminate: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Lavatories and Plumbing in Casework: Section 22 40 00, PLUMBING FIXTURES.
- D. Solid Surface Countertops, Section 12 36 00, Countertops.

1.3 MANUFACTURER'S QUALIFICATIONS

- A. 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
 - 3. Adhesive cements
- C. LEED Submittals:
 - 1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-

- accredited certification body. Include statement indicating cost for each certified wood product.
- 2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
- 3. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.
- D. Samples:
 - 1. Counter top, plastic laminate, 150 mm (six inch) square
- E. 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.
- F. 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 resident engineer.

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):
 - A167-99 (R2009).....Stainless and Heat-Resisting chromium-Nickel Steel Plate, Sheet and Strip
 - A1008-10.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy
 - C1036-06.....Flat Glass
- C. Composite Panel Association (CPA):
 - A208.1-09.....Particleboard
- D. U.S. Department of Commerce Product Standards (Prod. Std):
 - PS1-95.....Construction and Industrial Plywood
- E. Hardwood, Plywood and Veneer Association (HPVA):
 - HP-1-09.....Hardwood and Decorative Plywood
- F. Architectural Woodwork Institute (AWI):
 - Architectural Woodwork Quality Standards, Guide Specifications Quality Certification Program - 2009
- G. American Society of Mechanical Engineers (ASME):
 - A112.18.1-05.....Plumbing Fixture Fittings

H. National Electrical Manufacturers Association (NEMA):

LD3-05.....High Pressure Decorative Laminates

LD3.1-95.....Performance, Application Fabrication and
Installations of High-Pressure Decorative
Laminates

PART 2 - PRODUCTS

2.1 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.
- D. Backing sheet on bottom of plastic laminate covered wood tops. Backer Type BKL.
- E. Post Forming Fabrication, Decorative Surface: Post forming Type HGP.

2.2 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.

2.3 PARTICLEBOARD

- A. CPA A208.1, Type 1, Grade 1-M-3.

2.4 RUBBER OR VINYL BASE

- A. Straight (for carpet), cove (for resilient floor); 100 mm (6 inch) high, 3 mm (1/8 inch) thick, flexible to conform to irregularities in walls, partitions and floors.

2.5 PLUMBING FIXTURES

- A. ASME A112.18.1, except die-cast zinc-alloy material is not acceptable.

2.6 GLASS: ASTM C1036

- A. For Doors: Type I, Class 1, Quality q4.

2.7 SHEET STEEL

- A. ASTM A1008.

2.8 STAINLESS STEEL

- A. ASTM A167, with No. 4 finish.

2.9 HARDWARE

- A. 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.

B. Marking of Locks and Keys:

1. The name of the manufacturer, or trademark by which manufacturer can readily be identified, legibly marked on each lock.
2. The key change number marked on the exposed face of lock, and also stamped on each key.
3. Key change numbers shall provide sufficient information for replacement of the key by the manufacturer.

C. 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.

D. Door Catches:

1. Friction or Magnetic type, fabricated with metal housing.
2. Provide one catch for cabinet doors 1200 mm (48 inches) high and under, and two for doors over 1200 mm (48 inches) high.

E. Locks:

1. Cylinder type pin tumbler.
2. Equip doors and drawers where shown with locks.

F. 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.

G. Drawer Slides:

1. Full extension steel slides with nylon ball-bearing rollers.
2. Slides shall have positive stop.
3. Equip drawers with rubber bumpers.

H. Sliding Doors:

1. Each door shall be supported by two ball bearing bronze or nylon rollers, or sheaves riding on a stainless steel track at top or

- bottom, and shall be restrained by a nylon or stainless steel guide at the opposite end.
- 2. Plastic guides are not acceptable.
- 3. Each door shall have rubber silencers set near top and bottom of each jamb.
- I. Shelf Standards (Except For Fixed Shelves):
Bright zinc-plated steel for recessed mounting with screws, 16 mm (5/8 inch) wide by 5 mm (3/16 inch) high providing 13 mm (1/2 inch) adjustment, complete with shelf supports.

2.10 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. Fabricate casework of plastic laminated covered plywood or particleboard as follows:
 - 1. Where shown, doors, drawers, shelves all semi-concealed surfaces shall be plastic laminated.
 - 2. Glazed doors shall have 5 mm (3/16 inch) thick glass, set in glazing compound.
- C. 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.
- D. Base:
 - 1. Provide rubber or vinyl base with close, flush joints; set with adhesive.
 - 2. Remove adhesive from exposed surfaces.
 - 3. Install base at floor line after casework has been accurately leveled.
 - 4. Rub base to glossy finish.
- E. Countertops:
 - 1. See Section 12 36 00 COUNTERTOPS.
 - 2. Solid Surfacing Countertops:

- a. Countertops, splashbacks shall be solid surface cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
 - b. Superficial damage to a depth of 0.010 inch (.25mm) shall be repairable by sanding and/or polishing.
 - c. Countertops shall be $\frac{3}{4}$ inch thick.
 - d. Splashbacks shall be solid surface finished $\frac{3}{4}$ inch thick and be secured to countertops with concealed metal fastenings and with contact surfaces set in waterproof adhesive.
 - e. Provide cut outs for plumbing trim where shown.
- F. Sink bowls:
1. See Section 12 36 00 COUNTERTOPS and Section 22 40 00 PLUMBING FIXTURES.
- G. Provide the following plumbing trim and fittings:
1. Faucets: ASME A112.18.1 Type I, compression type, countertop mounted, chromium plated brass, having two valves and with swing-spout and gooseneck spout as shown, elevated to clear handles.
 2. Fittings shall have an elongated escutcheon for spout and handles, replaceable valve seats and four arm or lever style indexed chromium plated brass or stainless steel handles; handles either with or without hood.
- H. Drain:
1. Cast or wrought brass or stainless steel with flat strainer.
 2. Surfaces of drains exposed from above shall have a chromium plated finish.
- I. Traps: Cast brass.
- J. Spray Hose:
1. Hose shall drop below counter top when not in use and be of sufficient length to reach the entire length of the countertop.
 2. Concealed trim may be rough brass.
- K. Support Members for Tops of Tables:
1. Construct as detailed.
 2. Provide miscellaneous steel members and anchor as shown.
- L. Legs for Counters:
1. Fabricate legs for counters of 1.6 mm (0.0635 inch) thick, 38 mm (1-1/2 inch) square tubular stainless steel where shown.
 2. Secure legs to counter tops and provide legs at bottom with shoes not less than 25 mm (one inch) in height.

3. Fabricate shoes of either stainless steel, aluminum or chromium plated brass.

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.

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**SECTION 12 36 00
COUNTERTOPS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies casework countertops with integral accessories.
- B. Integral accessories include:
 - 1. Sinks with traps and drains.
 - 2. Eye and Face Wash Units.
 - 3. Mechanical Service fixtures.
 - 4. Electrical Receptacles.

1.2 RELATED WORK

- A. Color and patterns of plastic laminate: SECTION 09 06 00, SCHEDULE FOR FINISHES.
- B. DIVISION 22, PLUMBING.
- C. DIVISION 26, ELECTRICAL.
- D. Equipment Reference Manual for Section 12 36 00, COUNTERTOPS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings
 - 1. Show dimensions of section and method of assembly.
 - 2. Show details of construction at 1/2 scale.
- C. Samples:
 - 1. 150 mm (6 inch) square samples each top.
 - 2. Front edge, back splash, end splash and core with surface material and booking.
- D. LEED submittals:
 - 1. Certificates for Credit MR-7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
 - 2. Credit EQ 4.1:
Manufacturer's product data for installation adhesives, including printed statement of VOC content and material safety data sheets.
 - 3. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Hardboard Association (AHA):
A135.4-95.....Basic Hardboard
- C. Composite Panel Association (CPA):
A208.1-09.....Particleboard
- D. American Society of Mechanical Engineers (ASME):
A112.18.1-12.....Plumbing Supply Fittings
A112.1.2-12.....Air Gaps in Plumbing System
A112.19.3-08(R2004).....Stainless Steel Plumbing Fixtures (Designed for Residential Use)
- E. American Society for Testing and Materials (ASTM):
A167-99 (R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
A1008-10.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength, Low Alloy
D256-10.....Pendulum Impact Resistance of Plastic
D570-98(R2005).....Water Absorption of Plastics
D638-10.....Tensile Properties of Plastics
D785-08.....Rockwell Hardness of Plastics and Electrical Insulating Materials
D790-07.....Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D4690-99(2005).....Urea-Formaldehyde Resin Adhesives
G21-96 (R2002).....Determining Resistance of Synthetic Polymeric Materials to Fungi
- F. Federal Specifications (FS):
A-A-1936.....Adhesive, Contact, Neoprene Rubber
- G. U.S. Department of Commerce, Product Standards (PS):
PS 1-95.....Construction and Industrial Plywood
- H. National Electrical Manufacturers Association (NEMA):
LD 3-05.....High Pressure Decorative Laminates
LD 3.1-95.....Performance, Application, Fabrication, and Installation of High Pressure Decorative Laminates

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plastic Laminate: NEMA LD 3.

1. Concealed backing sheet Type BKL.

2. Decorative surfaces:

a. Flat components: Type GP-HGL.

b. Post forming: Type PF-HGP.

3. Chemical Resistant Surfaces

a. Flat components: Type GP-HGL.

b. Post forming: Type PF-HGP.

c. Resistance to reagents:

- 1) Test with five 0.25 mil drops remaining on surface for 16 hours followed by washing off with tap water, then cleaned with liquid soap and water, dried with soft cotton cloth and then cleaned with naphtha.

- 2) No change in color, surface texture, and original protectability remaining from test results of following reagents:

98% Acetic Acid	Butyl Alcohol	Acetone
90% Formic Acid--	Benzine	Chloroform
28% Ammonium Hydroxide	Xylene	Carbon
		Tetrachloride
Zinc Chloride (Sat.)	Toluene	Cresol
Sodium Carbonate (Sat.)	Gasoline	Ether
Calcium Hypochlorite (Sat.)	Kerosene	Cottonseed Oil
Sodium Chloride (Sat.)	Mineral Oil	40% Formaldehyde
Methyl Alcohol	Ethyl Acetate	Trichlorethylene
Ethyl Alcohol	Amyl Acetate	Monochlorobenzine

- 3) Superficial effects only: Slight color change, spot, or residue only with original protectability remaining from test results of following reagents:

77% Sulfuric Acid	37% Hydrochloric Acid	85% Phenol
33% Sulfuric Acid	20% Nitric Acid	Furfural
85% Phosphoric Acid	30% Nitric Acid	Dioxane

- 4) Minimum height of impact resistance: 300 mm (12 inches).

B. Molded Resin:

1. Non-glare epoxy resin or furan resin compounded and cured for minimum physical properties specified:

Flexural strength	70 MPa (10,000 psi)	ASTM D790
Rockwell hardness	105	ASTM D785
Water absorption, 14 hours (weight)	.01%	ASTM D570

2. Material of uniform mixture throughout.

C. Stainless Steel: ASTM A167, Type 304.

D. Sheet Steel: ASTM A1008, cold rolled, Class 1 finish, stretcher leveled.

E. Particleboard: CPA A208.1, Grade 2-M-2.

F. Plywood: PS 1, Exterior type, veneer grade AC not less than five ply construction.

G. Hardwood Countertop: Solid maple, clear grade except where other wise specified.

H. Hardboard: ANSI/AHA A135.4, Type I, tempered, fire retardant treated, smooth surface one side.

I. Adhesive

1. For plastic laminate FS A-A-1936.
2. For wood products: ASTM D4690, unextended urea resin or unextended melamine resin, phenol resin, or resorcinol resin.
3. For Field Joints:
 - a. Epoxy type, resistant to chemicals as specified for plastic laminate laboratory surfaces.
 - b. Fungi resistant: ASTM G-21, rating of 0.

J. Fasteners:

1. Metals used for welding same metal as materials joined.
2. Use studs, bolts, spaces, threaded rods with nuts or screws suitable for materials being joined with metal splice plates, channels or other supporting shape.

K. Solid Polymer Material:

1. Filled Methyl Methacrylic Polymer. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
2. Performance properties required:

Property	Result	Test
Elongation	0.3% min.	ASTM D638

Property	Result	Test
Hardness	90 Rockwell M	ASTM D785
Gloss (60° Gordon)	5-20	NEMA LD3.1
Color stability	No change	NEMA LD3 except 200 hour
Abrasion resistance	No loss of pattern Max wear depth 0.0762 mm (0.003 in) - 10000 cycles	NEMA LD3
Water absorption weight (5 max)	24 hours 0.9	ASTM D-570
Izod impact	14 N·m/m (0.25 ft-lb/in)	ASTM D256 (Method A)
Impact resistance	No fracture	NEMA LD-3 900 mm (36") drop 1 kg (2 lb.) ball
Boiling water surface resistance	No visible change	NEMA LD3
High temperature resistance	Slight surface dulling	NEMA LD3

3. Cast into sheet form and bowl form.
4. Color throughout with subtle veining through thickness.
5. Joint adhesive and sealer: Manufacturers silicone adhesive and sealant for joining methyl methacrylic polymer sheet.
6. Bio-based products will be preferred.

L. Laminar Flow Control Device

1. Smooth bright stainless steel or satin finish, chrome plated metal laminar flow device shall provide non-aeration, clear, coherent laminar flow that will not splash in basin. Device shall also have a flow control restrictor and have vandal resistant housing.
2. Flow Control Restrictor:
 - a. Capable of restricting flow of 7.5 to 8.5 Lpm (2.0 to 2.2 gpm) for sinks provided in paragraph 2.2D.
 - b. Compensates for pressure fluctuation maintaining flow rate specified above within 10 percent between 175 and 550 kPa (25 and 80 psi).
 - c. Operates by expansion and contraction, eliminates mineral/sediment building up with self clearing action, and is capable of easy manual cleaning.

2.2 SINKS

A. Molded Resin:

1. Cast or molded in one piece with interior corners 25 mm (one inch) minimum radius.
2. Minimum thickness of sides and ends 13 mm (1/2 inch), bottom 16 mm (5/8 inch).
3. Molded resin outlet for drain and standpipe overflow.
4. Provide clamping collar permitting connection to 38 mm (1-1/2 inch) or 50 mm (2 inch) waste outlet and trap, making sealed but not permanent connection.

B. Stainless Steel:

1. ANSI/ASME A112.19.3, Type 304.
2. Self rim for plastic laminate or similar tops with concealed fasteners.
3. Flat rim for welded into stainless steel tops.
4. Ledge back or ledge sides with holes to receive required fixtures when mounted on countertop.
5. Apply fire resistant sound deadening material to underside.

C. Stainless steel circular or oval shaped bowl.

D. Sinks of Methyl Methacrylic Polymer:

1. Minimum 19 mm (3/4 inch) thick, cast into bowl shape with overflow to drain.
2. Provide for underhung installation to countertop.
3. Provide openings for drain.

2.3 TRAPS AND FITTINGS

A. Material as specified in DIVISION 22, PLUMBING.

B. For Molded Resin Sinks:

1. Chemical resisting P-traps and fittings for chemical waste service.
2. Provide traps with cleanout plug easily removable without tools.

C. For Stainless Steel Sinks:

1. Either cast or wrought brass or stainless steel P-traps and drain fittings; ASME A112.18.1
2. Flat strainer, except where cup strainer or overflow standpipe specified.
 - a. Provide cup strainer in cabinet type 1B.
 - b. Provide stainless steel overflow stand pipe to within 38 mm (1-1/2 inches) of sink rim.
3. Exposed surface chromium plated finish.

D. Air Gap Fittings: ASME A112.1.2.

E. Methyl Methacrylic Polymer Sink Traps:

1. Cast or wrought brass with flat grid strainer, off-set tail piece, adjustable 38 x 32 mm (1-1/2 x 1 1/4-inch) P trap.
2. Chromium plated finish.

2.4 WATER FAUCETS

A. ASME A112.18.1.

1. Cast or forged brass, compression type with replaceable seat and stem assembly or replaceable cartridge.
2. Indexed lever handles either with or without head.
3. Gooseneck minimum clearance above countertop of 190 mm (7-1/2 inches), bent 180 degrees for vertical discharge.
4. Swing spouts elevated to clear handles.
5. Exposed brass surfaces chromium plated.
6. Cast combination hot and cold fixture with one piece body for multiple outlets.
7. Adapter type connection which will permit field conversion of swing spouts to fixed or gooseneck grouts or vice versa.
8. Pedestals Top for Laboratory or Pharmacy:
 - a. Modern design tapered to a round base, factory assembled and tested.
 - b. Brass shanks, locknuts and washers for attaching to top or curbs.

B. Laminar flow control device on spouts.

C. Automatic Controlled Faucets.

1. Infra-red photocell sensor and a solenoid valve to control water flow automatically.
2. Breaking light beam activates water flow.
3. Water stops when user moves away from light beam.

D. Eye and Face Wash Unit Pull-Out-Type:

1. Deck mounted.
2. Designed for vandal resistant push-down control valve and 6 foot hose.
3. Eye and face wash head, provide a soft stream for flushing action.
4. Valve, when opened; remain open until manually closed.

E. Eye and Face Bath, Counter Mounted:

1. Stainless Steel circular or oval shaped self rimmed sink, as shown on drawings.
2. Two fully enclosed rubber bound spray heads to provide an aerated flow of water simultaneously into both eyes and across face.
3. Push-pull hand operated valve.
4. Volume regulator for each spray.

F. Manifold, Tube-Washing:

1. Deck mounted
2. Three valved outlet, plus one bleeder outlet.
3. Vacuum breaker, and loose key stops with integral check valve.
- G. Vanity or Lavatory Faucets in Methyl Methacrylic Polymer tops:
 1. Extra long center set single lever handle control.
 2. Cast or wrought copper alloy, vandal resistant.
 3. Stainless steel ball type with replaceable non-metallic seats, stainless steel lined sockets.
 4. Handle always returning to the neutral position or cartridge body construction.
 5. Provide laminar flow control device.

2.5 FUEL GAS, LABORATORY AIR AND LABORATORY VACUUM FIXTURES

- A. Comply with criteria for faucets except as specified.
- B. Needle valves with stainless steel replaceable cone and valve seat.
- C. Provide valve with a bonnet with exterior packing and packing gland designed to permit valve to be repacked while under pressure.
- D. Valves withstand a minimum pressure of 700 kPa (100 psi) without leakage.
- E. Equip valves with four-arm handles and serrated hose ends. Do not provide laminar flow control device.
- F. Provide duplex fixtures except where otherwise shown.
- G. Factory assembled and tested.

2.6 FIXTURE IDENTIFICATION

- A. Code fixtures with full view plastic index buttons.
- B. Use following colors and codes:

SERVICE	COLOR	CODE	COLOR OF LETTERS
Cold Water	Dark Green	CW	White
Hot Water	Red	HW	White
Laboratory Air	Orange	AIR	Black
Fuel Gas	Dark Blue	GAS	White
Laboratory Vacuum	Yellow	VAC	Black
Distilled Water	White	DW	Black
Deionized Water	White	DI	Black
Oxygen	Light Green	OXY	White
Hydrogen	Pink	H	Black
Nitrogen	Gray	N	Black
All Other Gases	Light Blue	CHEM.SYM.	Black

2.7 ELECTRICAL RECEPTACLES

- A. Hospital grade per electrical specifications.
- B. Curb Mounted Receptacles:
 - 1. NEMA 5-20R duplex in galvanized steel box.
 - 2. Chromium plated brass or steel face plate.
- C. Pedestal Mounted Receptacles:
 - 1. NEMA 5-20R duplex installed in double faces.
 - 2. Polished stainless steel or aluminum, or chromium plated brass pedestal.

2.10 COUNTERTOPS

- A. Fabricate in largest sections practicable.
- B. Fabricate with joints flush on top surface.
- C. Fabricate countertops to overhang front of cabinets and end of assemblies 25 mm (one inch) except where against walls or cabinets.
- D. Provide 1 mm (0.039 inch) thick metal plate connectors or fastening devices (except epoxy resin tops).
- E. Join edges in a chemical resistant waterproof cement or epoxy cement, except weld metal tops.
- F. Fabricate with end splashes where against walls or cabinets.
- G. Splash Backs and End Splashes:
 - 1. Not less than 19 mm (3/4 inch) thick.
 - 2. Height 100 mm (4 inches) unless noted otherwise.
 - 3. Laboratories and pharmacy heights or where fixtures or outlets occur: Not less than 150 mm (6 inches) unless noted otherwise.
 - 4. Fabricate epoxy splash back in maximum lengths practical of the same material.
- H. Drill or cutout for sinks, and penetrations.
 - 1. Accurately cut for size of penetration.
 - 2. Cutout for VL 81 photographic enlarger cabinet.
 - a. Finish cutout to fit flush with vertical side of cabinet, allowing adjustable shelf to fit into cutout space of cabinet at counter top level. Finish cutout surface as an exposed edge.
 - b. Provide braces under enlarger space to support not less than 45 kg (100 pounds) centered on opening side along backsplash.
- I. Plastic Laminate Countertops:
 - 1. Fabricate plastic laminate on five-ply plywood or particleboard core 19 mm (3/4 inch) thick with plastic laminate backing sheet.
 - 2. Front edge over cabinets not less than 38 mm (1-1/2 inches) thick except where plastic "T" insert is used, not less than 19 mm (3/4 inch) thick.

3. Exposed Surface and edges of decorative laminated plastic or laboratory chemical resistant surface.
 - a. Use chemical resistant surface on tops 6A, 6B, and 6C.
 - b. Use decorative surface tops when noted plastic laminate, for tops 10A, 10B and 10C.

J. Molded Resin Tops:

1. Molded resin with drip groove cut on underside of overhanging edge.
2. Finish thickness of top minimum 25 mm (1 inch).
3. Joints: Epoxy Type.
4. Secure reagent shelves to counter tops with fasteners from underside and seal seam.

K. Methyl Methacrylic Polymer Tops:

1. Fabricate countertop of methyl methacrylic polymer cast sheet, 19 mm (3/4 inch) thick.
2. Fabricate back splash and end splash to height shown.
3. Fabricate skirt to depth shown.
4. Fabricate with marine edge where sinks occur.
5. Fabricate in one piece for full length from corner to corner up to 3600 mm (12 feet).
6. Join pieces with adhesive sealant.
7. Cut out countertop for lavatories, plumbing trim.
8. Provide concealed fasteners and epoxy cement for anchorage of sinks to countertop.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installing countertops verify that wall surfaces have been finished as specified and that mechanical and electrical service locations are as required.
- B. Secure countertops to supporting rails of cabinets with metal fastening devices, or screws through pierced slots in rails.
 1. Where type, size or spacing of fastenings is not shown or specified, submit shop drawings showing proposed fastenings and method of installation.
 2. Use round head bolts or screws.
 3. Use epoxy or silicone to fasten the epoxy resin countertops to the cabinets.
 4. Use wood or sheet metal screws for wood or plastic laminate tops; minimum penetration into top 16 mm (5/8 inch), screw size No 8, or 10.

C. Rubber Moldings:

1. Where shown install molding with butt joints in horizontal runs and mitered joints at corners where ceramic tile occurs omit molding.
2. Fasten molding to wall and to splashbacks and splashends with adhesive.

D. Sinks

1. Install stainless steel sink in plastic laminate tops with epoxy compound to form watertight seal under shelf rim.
 - a. In laboratory and pharmacy fit stainless steel sink with overflow standpipe.
 - b. Install faucets and fittings on sink ledges with watertight seals where shown.
2. Install molded resin sinks with epoxy compound to form watertight seal with underside of molded resin top.
 - a. Install sink with not less than two channel supports with threaded rods and nuts at each end, expansion bolted to molded resin top.
 - b. Design support for a twice the full sink weight.
 - c. Install with overflow standpipes.
3. Install methyl methacrylic polymer sinks in manufacturers recommended adhesive sealer or epoxy compound to underside of methyl methacrylic polymer countertop.
 - a. Bolt or screw to countertop to prevent separation of bowl and fracture of adhesive sealant joint.
 - b. Install drain and traps to sink.

E. Faucets, Fixtures, and Outlets:

1. Seal opening between fixture and top.
2. Secure to top with manufacturers standard fittings.

3.2 PROTECTION AND CLEANING

- A. Tightly cover and protect against dirt, water, and chemical or mechanical injury.
- B. Clean at completion of work.

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SECTION 13 05 41
SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Provide seismic restraint in accordance with the requirements of this section in order to maintain the integrity of nonstructural components of the building so that they remain safe and functional in case of seismic event.
- B. Definitions: Non-structural building components are components or systems that are not part of the building's structural system whether inside or outside, above or below grade. Non-structural components of buildings include:
 - 1. Architectural Elements: Facades that are not part of the structural system and its shear resistant elements; cornices and other architectural projections and parapets that do not function structurally; glazing; nonbearing partitions; suspended ceilings; stairs isolated from the basic structure; cabinets; bookshelves; medical equipment; and storage racks.
 - 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; 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. Division 09 - Finishes
- B. Division 10 - Specialties
- C. Division 11 - Equipment
- D. Division 12 - Furnishings
- E. Division 13 - Special Construction
- F. Division 21 - Fire Suppression
- G. Division 22 - Plumbing
- H. Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)
- I. Division 26 - Electrical

J. Division 27 - Communications

K. Division 28 - Electronic Safety and Security

1.3 QUALITY CONTROL:

A. Shop-Drawing Preparation:

1. Have seismic-force-restraint shop drawings and calculations prepared by a professional structural engineer experienced in the area of seismic force restraints. The professional structural engineer shall be registered in the state where the project is located.
2. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in the State where project is located.

B. Coordination:

1. Do not install seismic restraints until seismic restraint submittals are approved by the Resident Engineer.
2. Coordinate and install trapezes or other multi-pipe hanger systems prior to pipe installation.

C. Seismic Certification:

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.
4. For expansion bolts, include design load and capacity if different from those specified.

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.
 5. Location of all gravity load pipe supports and spacing requirements.
 6. Numerical value of gravity load reactions.
 7. Location of all seismic bracing.
 8. Numerical value of applied seismic brace loads.
 9. Type of connection (Vertical support, vertical support with seismic brace etc.).
 10. Seismic brace reaction type (tension or compression): Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.
- C. Submit 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 support and bracing components.
 3. Maximum spacing of hangers and bracing.
 4. Seal of registered structural engineer responsible for design.
- D. Submit design calculations prepared and sealed by the registered structural engineer specified above in paragraph 1.3A.
- E. 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):
355.2-07.....Qualification for Post-Installed Mechanical
Anchors in Concrete and Commentary
- C. American Institute of Steel Construction (AISC): Steel Construction
Manual, Thirteenth Edition.
- D. American Society for Testing and Materials (ASTM):

- A36/A36M-08.....Standard Specification for Carbon Structural Steel
- A53/A53M-10.....Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- A307-10.....Standard Specification for Carbon Steel Bolts and Studs; 60,000 PSI Tensile Strength.
- A325-10.....Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- A325M-09.....Standard Specification for High-Strength Bolts for Structural Steel Joints [Metric]
- A490-10.....Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
- A490M-10.....Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric]
- A500/A500M-10.....Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- A501-07.....Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- A615/A615M-09.....Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- A992/A992M-06.....Standard Specification for Steel for Structural Shapes for Use in Building Framing
- A996/A996M-09.....Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
- E488-96(R2003).....Standard Test Method for Strength of Anchors in Concrete and Masonry Element
- 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, February 2011
- H. National Uniform Seismic Installation Guidelines (NUSIG)
- I. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Seismic Restraint Manual - Guidelines for Mechanical Systems, 1998 Edition and Addendum

1.6 REGULATORY REQUIREMENT:

- A. IBC 2003.

B.Exceptions: The seismic restraint of the following items may be omitted:

1. Equipment weighing less than 400 pounds, which is supported directly on the floor or roof.
2. Equipment weighing less than 20 pounds, which is suspended from the roof or floor or hung from a wall.
3. Gas and medical piping less than 2 ½ inches inside diameter.
4. Piping in boiler plants and equipment rooms less than 1 ¼ inches inside diameter.
5. All other piping less than 2 ½ inches inside diameter, except for automatic fire suppression systems.
6. All piping suspended by individual hangers, 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.
7. All electrical conduits, less than 2 ½ inches inside diameter.
8. All rectangular air handling ducts less than six square feet in cross sectional area.
9. All round air handling ducts less than 28 inches in diameter.
10. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of support for the hanger.

PART 2 - PRODUCTS

2.1 STEEL:

- A. Structural Steel: ASTM A36 (miscellaneous shapes) A572 (W-shapes).
- B. Structural Tubing: ASTM A500, Grade B.
- C. Steel Pipe: ASTM A53/A53M, Grade B.
- D. Bolts & Nuts: ASTM A307 and A325 per plans.

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 design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.
- B. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.

- C. Construct seismic restraints and anchorage to allow for thermal expansion.
- D. Testing Before Final Inspection:
 - 1. Test 10-percent of anchors in masonry and concrete per ASTM E488, and ACI 355.2 to determine that they meet the required load capacity. If any anchor fails to meet the required load, test the next 20 consecutive anchors, which are required to have zero failure, before resuming the 10-percent testing frequency.
 - 2. Before scheduling Final Inspection, submit a report on this testing indicating the number and location of testing, and what anchor-loads were obtained.

3.2 EQUIPMENT RESTRAINT AND BRACING:

- A. See drawings for equipment to be restrained or braced.

3.3 MECHANICAL DUCTWORK AND PIPING; BOILER PLANT STACKS AND BREACHING; ELECTRICAL BUSWAYS, CONDUITS, AND CABLE TRAYS; AND TELECOMMUNICATION WIRES AND CABLE TRAYS

- A. Support and brace mechanical ductwork and piping; electrical busways, conduits and cable trays; and telecommunication wires and cable trays including boiler plant stacks and breeching to resist directional forces (lateral, longitudinal and vertical).
- B. Brace duct and breeching branches with a minimum of 1 brace per branch.
- C. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which will not displace sufficiently to damage adjacent or connecting equipment, or building members.
- D. Seismic Restraint of Piping:
 - 1. Design criteria:
 - a. Piping resiliently supported: Restrain to support 120 percent of the weight of the systems and components and contents.
 - b. Piping not resiliently supported: Restrain to support 60 percent of the weight of the system components and contents.
- 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.
- 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. 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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