

SPECIFICATIONS  
for  
**Design Renovation Expand  
Operator Room Suite**  
**@**  
**Oklahoma City  
VA Medical Center  
Oklahoma City, OK**

Project No: 635-12-302

APRIL 15, 2014

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- - - **END** - - -



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

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

**SECTION 01 00 00  
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, and furnish labor and materials and perform work for the 1<sup>ST</sup> AND 2<sup>ND</sup> FLOOR EXPANSION AND RENOVATION OF THE CLINIC ADDITION AT THE OKLAHOMA CITY VETERANS ADMINISTRATION MEDICAL CENTER as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the Contracting Officer.
- C. Offices of MED-ARCH, as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- D. Before placement and installation of work subject to tests by testing laboratory retained by Department of Veterans Affairs, the Contractor shall notify the COTR in sufficient time to enable testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the COTR.
- E. 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.
- F. Prior to commencing work, general contractor shall provide proof that a OSHA certified "competent person" (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the work site whenever the general or subcontractors are present.
- G. Training:
  - 1. All employees of general contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other

relevant competency training, as determined by VA CP with input from the ICRA team. The construction site superintendent will have complete the 30-hour OSHA certified Construction Safety Course.

2. Submit training records of all such employees for approval before the start of work.

#### **1.2 STATEMENT OF BID ITEM(S)**

- A. ITEM I, Contractor shall furnish labor and materials to construct Project # 635-12-302, FOR THE 7TH FLOOR RENOVATION AND EXPANSION OF THE OPERATOR ROOM SUITE as shown in the drawings and specifications: Work includes demolition, general construction, alterations, mechanical and electrical work, utility systems, and construction and certain other items.

#### **1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR**

- A. No drawings to be provided to Contractor. Contractor to have access to digital (PDF format) drawings for printing purposes. One (1) set of specifications will be furnished.

#### **1.4 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 the following regulations:

- |          |   |
|----------|---|
| CM 05-55 | <a href="#">Personnel Suitability and Security Program</a>      |
| CM 07B-3 | <a href="#">Law Enforcement</a>                                 |
| CM 07B-4 | <a href="#">Security of Buildings</a>                           |
| CM 07B-9 | <a href="#">Environment of Care Security Management Program</a> |

- 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 14 days notice to the Contracting Officer so that the COTR make arrangements. 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. Safety Monitor:

1. The General Contractor shall provide a safety monitor, usually the site superintendent at the project site during construction.
2. The safety monitor shall maintain a method for communication (i.e., a cellular phone) to report events the Contracting Officer, COTR and VA police.

D. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the COTR 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.

E. Document Control:

1. 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.

- 2 All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
- 7. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".

F. Motor Vehicle Restrictions

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

**1.5 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 COTR and Facility Safety Manager 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 COTR that individuals have undergone contractor's safety briefing. (See Center Memorandum 138-38 [EOC Control Guidelines for Construction and Renovation](#)).
- 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 the areas that are described in phasing requirements and adjoining areas. Construct partitions of gypsum board 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 COTR and facility Safety Manager.
- H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to COTR 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. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers.
- L. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, 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 COTR 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 COTR.

- M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with COTR and facility Safety Manager.
- N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COTR. Obtain permits from facility Safety Manager Officer at least 24 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work. Execute all work in accordance with facility Hot Work Permit.
- O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COTR and facility Safety Manager Officer.
- P. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas as established in CM 00-12 [Smoke Free Environment](#).
- Q. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- R. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.
- S. When required, submit documentation to the COTR that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

#### **1.6 OPERATIONS AND STORAGE AREAS**

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

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

**(FAR 52.236-10)**

- D. Working space and space available for storing materials shall be as determined by the Chief, Engineering Service.
- E. Workmen are subject to rules of Medical Center applicable to their conduct:

OOEEO-8      [Prevention of Workplace Harassment/Sexual Harassment](#)

CM 00-12      [Smoke Free Environment](#)

CM 00-30      [Staff Code of 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 COTR where required by limited working space.

1. Do not store materials and equipment in other than assigned areas.
2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.
3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.

F. 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 the COTR. All such actions shall be coordinated with the Utility Company involved. 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.

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

**Phase I:**

**Phase II:**

**Phase III:**

**Phase IV:**

**Phase V:**

H. Adjacent areas of the Surgical Department will be occupied during performance of work but immediate areas of alterations will be vacated prior to Demolition & construction of each Phase of Work.

1.

Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.

J. When an area of the building is turned over to Contractor, Contractor shall accept entire responsibility therefore.

1. Contractor shall maintain a minimum temperature of 4 degrees C (40 degrees F) at all times, except as otherwise specified.

2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with Fire Department or Company (Department of Veterans Affairs or municipal) whichever will be required to respond to an alarm from Contractor's employee or watchman.

K. Utilities Services: Maintain existing utility services for 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 the COTR.

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 the COTR. 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 COTR, 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 COTR.
  5. In case of a contract construction emergency, service will be interrupted on approval of COTR. 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.
  2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COTR.
- N. Coordinate the work for this contract with other construction operations as directed by the COTR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.
- O. Coordination of Construction with Medical Center Director: The Contractor must cooperate and coordinate with the Medical Center Director, through the Contracting Officer and the COTR, in arranging construction schedule to cause the least possible interference with

medical center activities in actual service areas. Construction noise during normal business hours shall not disturb medical center staff and patients. Workmen shall not pass through the service area during this period:

1. The Contractor is required to discontinue his work sufficiently in advance of Easter Sunday, Mother's Day, Father's Day, Memorial Day, Veteran's Day and/or Federal holidays, to permit him to clean up all areas of operation.
2. Cleaning up shall include the removal of all equipment, tools, materials and debris and leaving the areas in a clean, neat condition.

#### **1.7 ALTERATIONS**

A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COTR of areas of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both, to the Contracting Officer. This report shall list by rooms and spaces:

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of 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 the COTR.

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 the COTR, 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 the COTR 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.

#### **1.8 INFECTION PREVENTION MEASURES**

A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. The 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. Refer to CM 111-34 [Infection](#)

[Control Guidelines for Construction & Renovation](#). No work will be performed until an approved construction permit is issued by the COTR.

- 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 the COTR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- 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 COTR 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 and will be tested on a regular basis. 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 the COTR. 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 COTR. 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 and 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 COTR 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 COTR 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 cleaned prior to final inspection.

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

**1.10 PROTECTION OF EXISTING, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS**

- A. The Contractor shall preserve and protect all structures, equipment.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

**(FAR 52.236-9)**

- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and

"Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.

#### **1.11 RESTORATION**

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

#### **1.12 PHYSICAL DATA (NOT USED)**

**(FAR 52.236-4)**

**1.13 PROFESSIONAL SURVEYING SERVICES (NOT USED)****1.14 LAYOUT OF WORK (NOT USED)****1.15 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 COTR's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the COTR within 15 calendar days after each completed phase and after the acceptance of the project by the COTR.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

**1.16 USE OF ROADWAYS**

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the COTR, 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.

**1.17 COR'S FIELD OFFICE (NOT USED)****1.18 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT**

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to compliance with the following provisions:
  - 1. Permission to use each unit or system must be given by the COTR. If the equipment is not installed and maintained in accordance with the following provisions, the COTR 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.

#### **1.19 TEMPORARY USE OF EXISTING ELEVATORS**

- A'. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:
1. Contractor makes all arrangements with the COR for use of elevators. The COR will ascertain that elevators are in proper condition. Contractor may use elevators as directed by the COR. 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.

**1.20 TEMPORARY USE OF NEW ELEVATORS)**

- A. The Contractor and his personnel shall be permitted use of new elevator(s) subject to the following provisions:
  1. Contractor shall make arrangements with the COR for use of elevator(s). Contractor may obtain elevator(s) for exclusive use.
  2. Prior to the use of elevator(s), the Contractor shall have the elevator(s) inspected and accepted by an ASME accredited, certified elevator safety inspector. The acceptance report shall be submitted to the COR.
  3. Submit to the COR the schedule and procedures for maintaining equipment. Indicate the day or days of the week and total hours required for maintenance. A report shall be submitted to the COR monthly indicating the type of maintenance conducted, hours used, and any repairs made to the elevator(s).
  4. The Contractor shall be responsible for enforcing the maintenance procedures.

5. During temporary use of elevator(s) all repairs, equipment replacement and cost of maintenance shall be the responsibility of the Contractor.
6. Personnel for operating elevator(s) shall not be provided by the Department of Veterans Affairs.
7. Contractor shall cover and provide maximum protection of the entire elevator(s) installation.
8. The Contractor shall arrange for the elevator company to perform operation of the elevator(s) so that an ASME accredited, certified elevator safety inspector can evaluate the equipment. The Contractor shall be responsible for any costs of the elevator company.
9. All elevator(s) parts worn or damaged during temporary use shall be removed and replaced with new parts. This shall be determined by an ASME accredited certified elevator safety inspector after temporary use and before acceptance by the Government. Submit report to the COR for approval.
10. Elevator shall be tested as required by the testing section of the elevator(s) specifications before acceptance by the Department of Veterans Affairs.

#### **1.21 TEMPORARY TOILETS**

- A. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by the 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.

**1.23 NEW TELEPHONE EQUIPMENT (NOT USED)****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 INSTRUCTIONS**

- A. Contractor shall furnish Maintenance and Operating manuals and verbal instructions when required by the various sections of the specifications and as hereinafter specified.

- B. Manuals: Maintenance and operating manuals (four copies each) for each separate piece of equipment shall be delivered to the COTR 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 COTR and shall be considered concluded only when the COTR 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 COTR, 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 Schedule drawings.
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center.

**1.27 RELOCATED EQUIPMENT ITEMS**

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the COTR.
- 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 equipment, required to be relocated.
- F. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

**1.28 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT (NOT USED)****1.29 CONSTRUCTION SIGN (NOT USED)****1.30 SAFETY SIGN (NOT USED)**

**1.31 PHOTOGRAPHIC DOCUMENTATION (NOT USED)****1.32 FINAL ELEVATION DIGITAL IMAGES (NOT USED)****1.33 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 COTR verbally, and then with a written follow up.

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

- 1-1. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1-2. For the purposes of this contract, samples test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1-3. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
  - A. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;
  - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
  - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1-4. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals will not serve as a basis for extending contract time for completion.
- 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 in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
- B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Medical Center name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center name of Contractor, manufacturer, brand, contract number and ASTM or



- Federal Specification Number as applicable and location(s) on project.
3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
- 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 , shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to

MED-ARCH LLC

(Architect-Engineer)

1401 SOUTH DENVER AVE. , SUITE "C"

(A/E P.O. Address)

TULSA, OK 74119

(City, State and Zip Code)

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. Samples for approval shall be sent to Architect-Engineer, in care of Resident Engineer, VA Medical Center,

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(P.O. Address)

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(City, State and Zip Code)

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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)  
811 Vermont Avenue, NW - Room 462  
Washington, DC 20420  
Telephone Numbers: (202) 461-8217 or (202) 461-8292  
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.cpm.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 74 19**  
**CONSTRUCTION WASTE MANAGEMENT**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
  - 1. Waste Management Plan development and implementation.
  - 2. Techniques to minimize waste generation.
  - 3. Sorting and separating of waste materials.
  - 4. Salvage of existing materials and items for reuse or resale.
  - 5. Recycling of materials that cannot be reused or sold.
- D. At a minimum the following waste categories shall be diverted from landfills:
  - 1. Soil.
  - 2. Inerts (eg, concrete, masonry and asphalt).
  - 3. Clean dimensional wood and palette wood.
  - 4. Green waste (biodegradable landscaping materials).
  - 5. Engineered wood products (plywood, particle board and I-joists, etc).
  - 6. Metal products (eg, steel, wire, beverage containers, 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.
- C. Lead Paint: Section 02 83 33.13, LEAD BASED PAINT REMOVAL AND DISPOSAL.

**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. Contractor shall provide all demolition, removal and legal disposal of materials.

**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.

#### **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. 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. 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.

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**SECTION 01 91 00****GENERAL COMMISSIONING REQUIREMENTS****PART 1 - GENERAL****1.1 COMMISSIONING DESCRIPTION**

- A. This Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS shall form the basis of the construction phase commissioning process and procedures. The Commissioning Agent shall add, modify, and refine the commissioning procedures, as approved by the Department of Veterans Affairs (VA), to suit field conditions and actual manufacturer's equipment, incorporate test data and procedure results, and provide detailed scheduling for all commissioning tasks.
- B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the Division 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 16.01 ARCHITECTURAL AND ENGINEERING CPM SCHEDULES
- C. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
- D. Section 01 81 11 SUSTAINABLE DESIGN REQUIREMENTS
- E. Section 21 08 00 COMMISSIONING OF FIRE PROTECTION SYSTEMS.
- F. Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.
- G. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.
- H. Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.
- I. Section 27 08 00 COMMISSIONING OF COMMUNICATIONS SYSTEMS.
- J. 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.

### 1.5 ACRONYMS

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

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

## 1.6 DEFINITIONS

**Acceptance Phase Commissioning:** Commissioning tasks executed after most construction has been completed, most Site Observations and Static Tests have been completed and Pre-Functional Testing has been completed and accepted. The main commissioning activities performed during this phase are verification that the installed systems are functional by conducting Systems Functional Performance tests and Owner Training.

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

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

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

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

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

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

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

**COBie:** Construction Operations Building Information Exchange (COBie) is an electronic industry data format used to transfer information developed during design, construction, and commissioning into the Computer Maintenance Management Systems (CMMS) used to operate facilities. See the Whole Building Design Guide website for further information (<http://www.wbdg.org/resources/cobie.php>)

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

**Commissioning Agent (CxA):** The qualified Commissioning Professional who administers the Cx process by managing the Cx team and overseeing the

Commissioning Process. Where CxA is used in this specification it means the Commissioning Agent, members of his staff or appointed members of the commissioning team. Note that LEED uses the term Commissioning Authority in lieu of Commissioning Agent.

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

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

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

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

**Commissioning Observation:** An issue identified by the Commissioning Agent or other member of the Commissioning Team that does not conform to the project OPR, contract documents or standard industry best practices. (See also Commissioning Issue)

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

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



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

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

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

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

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

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

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

**Coordination Drawings:** Drawings showing the work of all trades that are used to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances. On mechanical projects, coordination drawings include structural steel, ductwork, major piping and electrical conduit and show the elevations and locations of the above components.

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

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

**Deficiency:** See "Commissioning Issue".

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

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

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

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

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

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

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

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

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

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

**Integrated System Testing:** Integrated Systems Testing procedures entail testing of multiple integrated systems performance to verify proper

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

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

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

**Maintainability:** A design component or construction process that will allow a system or component to be effectively maintained. This includes adequate room for access to adjust and repair the equipment. Maintainability also includes components that have readily obtainable repair parts or service.

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

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

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

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

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

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

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

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

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

**Resolution:** This word has two meanings in the Cx Process. The first refers to the smallest change in a measured variable that an instrument can detect. The second refers to the implementation of actions that correct a tested or observed deficiency.

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

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

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

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

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

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

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

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

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

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

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

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

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

1. First party validation occurs when a firm or individual verifying the task is the same firm or individual performing the task.
2. Second party validation occurs when the firm or individual verifying the task is under the control of the firm performing the task or has other possibilities of financial conflicts of interest in the resolution (Architects, Designers, General Contractors and Third Tier Subcontractors or Vendors).

3. Third party validation occurs when the firm verifying the task is not associated with or under control of the firm performing or designing the task.

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

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

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

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

**1.7 SYSTEMS TO BE COMMISSIONED**

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

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

Systems To Be Commissioned	
System	Description

<b>Systems To Be Commissioned</b>	
<b>System</b>	<b>Description</b>
<b>Specialties</b>	
Patient Bed Service Walls	Medical gas certification and cross check, electrical connections
<b>Equipment</b>	
Biological Safety Cabinets	Cabinet Certification
<b>Conveying Equipment</b>	
Elevators	Interface with other systems (fire alarm, etc.) [ASTM testing and certification by others]
Pneumatic Tube Systems	Interface with other systems (fire alarm, etc.)
<b>Fire Suppression</b>	
Fire Sprinkler Systems	Wet pipe system, dry pipe system, pre-action system, special agent systems
<b>Plumbing</b>	
Domestic Water Distribution	Booster pumps, backflow preventers, water softeners, potable water storage tanks
Domestic Hot Water Systems	Water heaters**, heat exchangers, circulation pumps, point-of-use water heaters*
Sanitary Waste Interceptors	Grease interceptors, acid neutralizers
General Service Air Systems	Packaged compressor systems, air dryers, filtration

<b>Systems To Be Commissioned</b>	
<b>System</b>	<b>Description</b>
Medical Air Systems	Packaged medical air compressor units. Outlet certification, cross-connection verification
Medical Vacuum Systems	Packaged medical vacuum units, outlet certification, cross-connection verification
Medical Gas Systems (other than Medical Air Systems)	Medical gas (oxygen, nitrogen, nitrous oxide, etc.) tank/manifold systems, outlet certification, cross-connection verification
<b>HVAC</b>	
Noise and Vibration Control	Noise and vibration levels for critical equipment such as Air Handlers, Chillers, Cooling Towers, Boilers, Generators, etc. will be commissioned as part of the system commissioning
Direct Digital Control System**	Operator Interface Computer, Operator Work Station (including graphics, point mapping, trends, alarms), Network Communications Modules and Wiring, Integration Panels. [DDC Control panels will be commissioned with the systems controlled by the panel]
Chilled Water System**	Chillers (centrifugal, rotary screw, air-cooled), pumps (primary, secondary, variable primary), VFDs associated with chilled water system components, DDC Control Panels (including integration with Building Control System)



<b>Systems To Be Commissioned</b>	
<b>System</b>	<b>Description</b>
HVAC Air Handling Systems**	Air handling Units, packaged rooftop AHU, Outdoor Air conditioning units, humidifiers, DDC control panels
HVAC Ventilation/Exhaust Systems	General exhaust, toilet exhaust, laboratory exhaust, isolation exhaust, room pressurization control systems
Decentralized Unitary HVAC Systems*	Split-system HVAC systems, controls, interface with facility DDC
Humidity Control Systems	Humidifiers, de-humidifiers, controls, interface with facility DDC
Smoke Evacuation System	Atrium smoke evacuation, other smoke evacuation and smoke management systems, controls, interface with other systems (fire alarm), emergency operation.
<b>Electrical</b>	
Medium-Voltage Electrical Distribution Systems	Medium-Voltage Switchgear, Medium-Voltage Switches, Underground ductbank and distribution, Pad-Mount Transformers, Medium-Voltage Load Interrupter Switches,
Grounding & Bonding Systems	Witness 3rd party testing, review reports
Electric Power Monitoring Systems	Metering, sub-metering, power monitoring systems, PLC control systems
Electrical System Protective Device Study	Review reports, verify field settings consistent with Study

<b>Systems To Be Commissioned</b>	
<b>System</b>	<b>Description</b>
Low-Voltage Distribution System	Normal power distribution system, Life-safety power distribution system, critical power distribution system, equipment power distribution system, switchboards, distribution panels, panelboards, verify breaker testing results (injection current, etc)
Lighting & Lighting Control** Systems	Emergency lighting, occupancy sensors, lighting control systems, architectural dimming systems, theatrical dimming systems, exterior lighting and controls
<b>Communications</b>	
Intercom & Program Systems	Witness 3rd party testing, review reports
Nurse Call & Code Blue Systems	Witness 3rd party testing, review reports
Security Emergency Call Systems	Witness 3rd party testing, review reports
<b>Electronic Safety and Security</b>	
Grounding & Bonding	Witness 3rd party testing, review reports

<b>Systems To Be Commissioned</b>	
<b>System</b>	<b>Description</b>
Fire Detection and Alarm System	100% device acceptance testing, battery draw-down test, verify system monitoring, verify interface with other systems.
<b>Renewable Energy Sources</b>	
<b>Site Utilities</b>	
Fire Alarm Response	Integrated System Response to Fire Alarm Condition and Return to Normal
<b>Table Notes</b>	
** Denotes systems that LEED requires to be commissioned to comply with the LEED Fundamental Commissioning pre-requisite.	

#### 1.8 COMMISSIONING TEAM

- A. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, schedulers, suppliers, and specialists deemed appropriate by the Department of Veterans Affairs (VA) and Commissioning Agent.
- B. Members Appointed by Contractor:
1. Contractor' Commissioning Manager: The designated person, company, or entity that plans, schedules and coordinates the commissioning activities for the construction team.

2. Contractor's Commissioning Representative(s): Individual(s), each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.

C. Members Appointed by VA:

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

**1.9 VA'S COMMISSIONING RESPONSIBILITIES**

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

**1.10 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES**

- A. The Contractor shall assign a Commissioning Manager to manage commissioning activities of the Contractor, and subcontractors.
- B. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.
- C. The Contractor shall ensure that each installing subcontractor shall assign representatives with expertise and authority to act on behalf of

the subcontractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:

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

#### **1.11 COMMISSIONING AGENT'S RESPONSIBILITIES**

- A. Organize and lead the commissioning team.
- B. Prepare the commissioning plan. See Paragraph 1.11-A of this specification Section for further information.
- C. Review and comment on selected submittals from the Contractor for general conformance with the Construction Documents. Review and comment on the ability to test and operate the system and/or equipment, including providing gages, controls and other components required to operate, maintain, and test the system. Review and comment on

- performance expectations of systems and equipment and interfaces between systems relating to the Construction Documents.
- D. At the beginning of the construction phase, conduct an initial construction phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; Pre-Functional Checklists, Systems Functional Performance Testing; and project completion.
  - E. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss status of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The Commissioning Agent shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.
  - F. Observe construction and report progress, observations and issues. Observe systems and equipment installation for adequate accessibility for maintenance and component replacement or repair, and for general conformance with the Construction Documents.
  - G. Prepare Project specific Pre-Functional Checklists and Systems Functional Performance Test procedures.
  - H. Coordinate Systems Functional Performance Testing schedule with the Contractor.
  - I. Witness selected systems startups.
  - J. Verify selected Pre-Functional Checklists completed and submitted by the Contractor.
  - K. Witness and document Systems Functional Performance Testing.
  - L. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
  - M. Review and comment on operation and maintenance (O&M) documentation and systems manual outline for compliance with the Contract Documents. Operation and maintenance documentation requirements are specified in Paragraph 1.25, Section 01 00 00 GENERAL REQUIREMENTS.
  - N. Review operation and maintenance training program developed by the Contractor. Verify training plans provide qualified instructors to conduct operation and maintenance training.
  - O. Prepare commissioning Field Observation Reports.

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

#### **1.12 COMMISSIONING DOCUMENTATION**

- A. Commissioning Plan: A document, prepared by Commissioning Agent, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited, to the following:
  - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
  - 2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
  - 3. Identification of systems and equipment to be commissioned.
  - 4. Schedule of Commissioning Coordination meetings.
  - 5. Identification of items that must be completed before the next operation can proceed.
  - 6. Description of responsibilities of commissioning team members.
  - 7. Description of observations to be made.
  - 8. Description of requirements for operation and maintenance training.
  - 9. Schedule for commissioning activities with dates coordinated with overall construction schedule.

10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
  11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
  12. Preliminary Systems Functional Performance Test procedures.
- B. Systems Functional Performance Test Procedures: The Commissioning Agent will develop Systems Functional Performance Test Procedures for each system to be commissioned, including subsystems, or equipment and interfaces or interlocks with other systems. Systems Functional Performance Test Procedures will include a separate entry, with space for comments, for each item to be tested. Preliminary Systems Functional Performance Test Procedures will be provided to the VA, Architect/Engineer, and Contractor for review and comment. The Systems Performance Test Procedure will include test procedures for each mode of operation and provide space to indicate whether the mode under test responded as required. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:
1. Name and identification code of tested system.
  2. Test number.
  3. Time and date of test.
  4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
  5. Dated signatures of the person performing test and of the witness, if applicable.
  6. Individuals present for test.
  7. Observations and Issues.
  8. Issue number, if any, generated as the result of test.
- C. Pre-Functional Checklists: The Commissioning Agent will prepare Pre-Functional Checklists. Pre-Functional Checklists shall be completed and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will spot check Pre-Functional Checklists to verify accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.
- D. Test and Inspection Reports: The Commissioning Agent will record test data, observations, and measurements on Systems Functional Performance



Test Procedure. The report will also include recommendation for system acceptance or non-acceptance. Photographs, forms, and other means appropriate for the application shall be included with data.

Commissioning Agent Will compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.

- E. Corrective Action Documents: The Commissioning Agent will document corrective action taken for systems and equipment that fail tests. The documentation will include any required modifications to systems and equipment and/or revisions to test procedures, if any. The Commissioning Agent will witness and document any retesting of systems and/or equipment requiring corrective action and document retest results.
- F. Commissioning Issues Log: The Commissioning Agent will prepare and maintain Commissioning Issues Log that describes Commissioning Issues and Commissioning Observations that are identified during the Commissioning process. These observations and issues include, but are not limited to, those that are at variance with the Contract Documents. The Commissioning Issues Log will identify and track issues as they are encountered, the party responsible for resolution, progress toward resolution, and document how the issue was resolved. The Master Commissioning Issues Log will also track the status of unresolved issues.
  - 1. Creating an Commissioning Issues Log Entry:
    - a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
    - b. Assign a descriptive title for the issue.
    - c. Identify date and time of the issue.
    - d. Identify test number of test being performed at the time of the observation, if applicable, for cross reference.
    - e. Identify system, subsystem, and equipment to which the issue applies.
    - f. Identify location of system, subsystem, and equipment.
    - g. Include information that may be helpful in diagnosing or evaluating the issue.
    - h. Note recommended corrective action.
    - i. Identify commissioning team member responsible for corrective action.

- j. Identify expected date of correction.
  - k. Identify person that identified the issue.
2. Documenting Issue Resolution:
- a. Log date correction is completed or the issue is resolved.
  - b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
  - c. Identify changes to the Contract Documents that may require action.
  - d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
  - e. Identify person(s) who corrected or resolved the issue.
  - f. Identify person(s) verifying the issue resolution.
- G. Final Commissioning Report: The Commissioning Agent will document results of the commissioning process, including unresolved issues, and performance of systems, subsystems, and equipment. The Commissioning Report will indicate whether systems, subsystems, and equipment have been properly installed and are performing according to the Contract Documents. This report will be used by the Department of Veterans Affairs when determining that systems will be accepted. This report will be used to evaluate systems, subsystems, and equipment and will serve as a future reference document during VA occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents and those that do not meet requirements of the Contract Documents. The commissioning report will include, but is not limited to, the following:
- 1. Lists and explanations of substitutions; compromises; variances with the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. Design Narrative documentation maintained by the Commissioning Agent.
  - 2. Commissioning plan.
  - 3. Pre-Functional Checklists completed by the Contractor, with annotation of the Commissioning Agent review and spot check.
  - 4. Systems Functional Performance Test Procedures, with annotation of test results and test completion.
  - 5. Commissioning Issues Log.
  - 6. Listing of deferred and off season test(s) not performed, including the schedule for their completion.

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

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

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

1. Design Narrative, including system narratives, schematics, single-line diagrams, flow diagrams, equipment schedules, and changes made throughout the Project.
2. Reference to Final Commissioning Plan.
3. Reference to Final Commissioning Report.
4. Approved Operation and Maintenance Data as submitted by the Contractor.

### **1.13 SUBMITTALS**

A. Preliminary Commissioning Plan Submittal: The Commissioning Agent has prepared a Preliminary Commissioning Plan based on the final Construction Documents. The Preliminary Commissioning Plan is included as an Appendix to this specification section. The Preliminary Commissioning Plan is provided for information only. It contains preliminary information about the following commissioning activities:

1. The Commissioning Team: A list of commissioning team members by organization.
2. Systems to be commissioned. A detailed list of systems to be commissioned for the project. This list also provides preliminary information on systems/equipment submittals to be reviewed by the

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

Systems Functional Test Procedures to be used in Systems Functional Performance Testing.

- D. Pre-Functional Checklists: The Commissioning Agent will submit Pre-Functional Checklists to be completed by the Contractor.
- E. Test and Inspection Reports: The Commissioning Agent will submit test and inspection reports to the VA with copies to the Contractor and the Architect/Engineer.
- F. Corrective Action Documents: The Commissioning Agent will submit corrective action documents to the VA 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 30 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 30 days of contract award, the Contractor shall ensure that each subcontractor designates specific individuals as Commissioning Representatives (CXR) to be responsible for commissioning related tasks. The Contractor shall ensure the designated Commissioning Representatives participate in the commissioning process as team members providing commissioning testing services, equipment operation, adjustments, and corrections if necessary. The Contractor shall ensure that all Commissioning Representatives shall have sufficient authority to direct their respective staff to provide the services required, and to speak on behalf of their organizations in all commissioning related contractual matters.

#### **1.15 QUALITY ASSURANCE**

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

#### **1.16 COORDINATION**

- A. Management: The Commissioning Agent will coordinate the commissioning activities with the VA and Contractor. The Commissioning Agent will submit commissioning documents and information to the VA. All commissioning team members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- B. Scheduling: The Contractor shall work with the Commissioning Agent and the VA to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks, durations and predecessors) on commissioning activities to allow the Contractor and the VA to schedule commissioning activities. All parties shall address scheduling issues and make necessary notifications in a timely manner

- in order to expedite the project and the commissioning process. The Contractor shall update the Master Construction as directed by the VA.
- C. Initial Schedule of Commissioning Events: The Commissioning Agent will provide the initial schedule of primary commissioning events in the Commissioning Plan and at the commissioning coordination meetings. The Commissioning Plan will provide a format for this schedule. As construction progresses, more detailed schedules will be developed by the Contractor with information from the Commissioning Agent.
  - D. Commissioning Coordinating Meetings: The Commissioning Agent will conduct periodic Commissioning Coordination Meetings of the commissioning team to review status of commissioning activities, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
  - E. Pretesting Meetings: The Commissioning Agent will conduct pretest meetings of the commissioning team to review startup reports, Pre-Functional Checklist results, Systems Functional Performance Testing procedures, testing personnel and instrumentation requirements.
  - F. Systems Functional Performance Testing Coordination: The Contractor shall coordinate testing activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. The Contractor shall coordinate the schedule times for tests, inspections, obtaining samples, and similar activities.

## **PART 2 - PRODUCTS**

### **2.1 TEST EQUIPMENT**

- A. The Contractor shall provide all standard and specialized testing equipment required to perform Systems Functional Performance Testing. Test equipment required for Systems Functional Performance Testing will be identified in the detailed System Functional Performance Test Procedure prepared by the Commissioning Agent.
- B. Data logging equipment and software required to test equipment shall be provided by the Contractor.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5 °C (1.0 °F) and a resolution of + or - 0.1 °C (0.2 °F). Pressure sensors

shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.



**PART 3 - EXECUTION****3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES**

A. The following table outlines the roles and responsibilities for the Commissioning Team members during the Construction Phase:

Spec Writer's Notes: Edit the following tables to describe the roles and responsibilities for each commissioning team member for each of the commissioning tasks as appropriate for the project.

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Construction Commissioning Kick Off meeting	L	A	P	P	O	
	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Controls Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support the OPR and BOD.	L	A	P	P	N/A	
Cx Plan & Spec	Final Commissioning Plan	L	A	R	R	O	
Schedules	Duration Schedule for Commissioning Activities	L	A	R	R	N/A	

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional	
Commissioning Roles & Responsibilities								
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O		
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O		
Document Reviews	TAB Plan Review	L	A	R	R	O		
	Submittal and Shop Drawing Review	R	A	R	L	O		
	Review Contractor Equipment Startup Checklists	L	A	R	R	N/A		
	Review Change Orders, ASI, and RFI	L	A	R	R	N/A		
Site Observations	Witness Factory Testing	P	A	P	L	O		
	Construction Observation Site Visits	L	A	R	R	O		
Functional Test Protocols	Final Pre-Functional Checklists	L	A	R	R	O		
	Final Functional Performance Test Protocols	L	A	R	R	O		
Technical Activities	Issues Resolution Meetings	P	A	P	L	O		

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Reports and Logs	Status Reports	L	A	R	R	O	
	Maintain Commissioning Issues Log	L	A	R	R	O	

B. The following table outlines the roles and responsibilities for the Commissioning Team members during the Acceptance Phase:

Acceptance Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Pre-Test Coordination Meeting	L	A	P	P	O	
	Lessons Learned and Commissioning Report Review Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support OPR and BOD	L	P	P	P	O	

Acceptance Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional	
Commissioning Roles & Responsibilities								
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes	
Cx Plan & Spec	Maintain/Update Commissioning Plan	L	A	R	R	O		
Schedules	Prepare Functional Test Schedule	L	A	R	R	O		
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O		
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O		
Document Reviews	Review Completed Pre-Functional Checklists	L	A	R	R	O		
	Pre-Functional Checklist Verification	L	A	R	R	O		
	Review Operations & Maintenance Manuals	L	A	R	R	R		
	Training Plan Review	L	A	R	R	R		
	Warranty Review	L	A	R	R	O		
	Review TAB Report	L	A	R	R	O		
Site Observations	Construction Observation Site Visits	L	A	R	R	O		
	Witness Selected Equipment Startup	L	A	R	R	O		
Functional Test Protocols	TAB Verification	L	A	R	R	O		
	Systems Functional Performance Testing	L	A	P	P	P		
	Retesting	L	A	P	P	P		

Acceptance Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional	
Commissioning Roles & Responsibilities								
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes	
Technical Activities	Issues Resolution Meetings	P	A	P	L	O		
	Systems Training	L	S	R	P	P		
Reports and Logs	Status Reports	L	A	R	R	O		
	Maintain Commissioning Issues Log	L	A	R	R	O		
	Final Commissioning Report	L	A	R	R	R		
	Prepare Systems Manuals	L	A	R	R	R		

C. The following table outlines the roles and responsibilities for the Commissioning Team members during the Warranty Phase:

Warranty Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = Resident Engineer					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Post-Occupancy User Review Meeting	L	A	O	P	P	
Site Observations	Periodic Site Visits	L	A	O	O	P	
Functional Test Protocols	Deferred and/or seasonal Testing	L	A	O	P	P	
Technical Activities	Issues Resolution Meetings	L	S	O	O	P	
	Post-Occupancy Warranty Checkup and review of Significant Outstanding Issues	L	A		R	P	
Reports and Logs	Final Commissioning Report Amendment	L	A		R	R	
	Status Reports	L	A		R	R	

### 3.2 STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS

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

- d. The Contractor shall review and evaluate the procedures and the format for documenting them, noting any procedures that need to be revised or added.
3. Sensor and Actuator Calibration
    - a. All field installed temperature, relative humidity, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 21, Division 22, Division 23, Division 26, Division 27, and Division 28 specifications.
    - b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
  4. Execution of Equipment Startup
    - a. Four weeks prior to equipment startup, the Contractor shall schedule startup and checkout with the VA and Commissioning Agent. The performance of the startup and checkout shall be directed and executed by the Contractor.
    - b. The Commissioning Agent will observe the startup procedures for selected pieces of primary equipment.
    - c. The Contractor shall execute startup and provide the VA and Commissioning Agent with a signed and dated copy of the completed startup checklists, and contractor tests.
    - d. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

### **3.3 DEFICIENCIES, NONCONFORMANCE, AND APPROVAL IN CHECKLISTS AND STARTUP**

- A. The Contractor shall clearly list any outstanding items of the initial startup and Pre-Functional Checklist procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be provided to the VA and the Commissioning Agent within two days of completion.
- B. The Commissioning Agent will review the report and submit comments to the VA. The Commissioning Agent will work with the Contractor to correct and verify deficiencies or uncompleted items. The Commissioning



Agent will involve the VA and others as necessary. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the VA and Commissioning Agent as soon as outstanding items have been corrected. The Contractor shall submit an updated startup report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the Commissioning Agent will recommend approval of the checklists and startup of each system to the VA.

- C. The Contractor shall be responsible for resolution of deficiencies as directed the VA.

### **3.4 PHASED COMMISSIONING**

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

### **3.5 DDC SYSTEM TRENDING FOR COMMISSIONING**

- A. Trending is a method of testing as a standalone method or to augment manual testing. The Contractor shall trend any and all points of the system or systems at intervals specified below.
- B. Alarms are a means to notify the system operator that abnormal conditions are present in the system. Alarms shall be structured into three tiers - Critical, Priority, and Maintenance.
  - 1. Critical alarms are intended to be alarms that require the immediate attention of and action by the Operator. These alarms shall be displayed on the Operator Workstation in a popup style window that is graphically linked to the associated unit's graphical display. The popup style window shall be displayed on top of any active window within the screen, including non DDC system software.
  - 2. Priority level alarms are to be printed to a printer which is connected to the Operator's Work Station located within the engineer's office. Additionally Priority level alarms shall be able to be monitored and viewed through an active alarm application. Priority level alarms are alarms which shall require reaction from the operator or maintenance personnel within a normal work shift, and not immediate action.

3. Maintenance alarms are intended to be minor issues which would require examination by maintenance personnel within the following shift. These alarms shall be generated in a scheduled report automatically by the DDC system at the start of each shift. The generated maintenance report will be printed to a printer located within the engineer's office.
- C. The Contractor shall provide a wireless internet network in the building for use during controls programming, checkout, and commissioning. This network will allow project team members to more effectively program, view, manipulate and test control devices while being in the same room as the controlled device.
  - D. The Contractor shall provide graphical trending through the DDC control system of systems being commissioned. Trending requirements are indicated below and included with the Systems Functional Performance Test Procedures. Trending shall occur before, during and after Systems Functional Performance Testing. The Contractor shall be responsible for producing graphical representations of the trended DDC points that show each system operating properly during steady state conditions as well as during the System Functional Testing. These graphical reports shall be submitted to the 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.

<b>Dual-Path Air Handling Unit Trending and Alarms</b>							
<b>Point</b>	<b>Type</b>	<b>Trend Interval</b>	<b>Operational Trend Duration</b>	<b>Testing Trend Duration</b>	<b>Alarm Type</b>	<b>Alarm Range</b>	<b>Alarm Delay</b>
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

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
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
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

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 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		
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		

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

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		

4-Pipe Fan Coil Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
SA Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Pre-Filter Status	AI	None	None	None	M	> SP	1 hour
Water Sensor	DI	COV	12 hours	3 days	M	N/A	30 Min

4-Pipe Fan Coil Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Cooling Coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Heating coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Fan Coil ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min

2-Pipe Fan Coil Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
SA Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Pre-Filter Status	AI	None	None	None	M	> SP	1 hour
Water Sensor	DI	COV	12 hours	3 days	M	N/A	30 Min
Cooling Coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Fan Coil ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min

Unit Heater Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay

Unit Heater Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Heating Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Unit Heater ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min

Steam and Condensate Pumps Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Steam Flow (LB/HR)	AI	15 Minutes	12 hours	3 days	N/A		
Condensate Pump Run Hours	AI	15 Minutes	12 hours	3 days	N/A		
Water Meter (GPM)	AI	15 Minutes	12 hours	3 days	N/A		
Electric Meter (KW/H)	AI	15 Minutes	12 hours	3 days	N/A		
Irrigation Meter (GPM)	AI	15 Minutes	12 hours	3 days	N/A		
Chilled Water Flow (TONS)	AI	15 Minutes	12 hours	3 days	N/A		
Condensate Flow (GPM)	AI	15 Minutes	12 hours	3 days	N/A		
High Water Level Alarm	DI	COV	12 hours	3 days	C	True	5 Min
Condensate Pump Start/Stop	DO	COV	12 hours	3 days	P	Status <> Command	10 min

Domestic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay



Domestic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Domestic HW Setpoint WH-1	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Setpoint WH-2	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	C	> 135 °F	10 Min
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	P	±5°F from SP	10 Min
Dom. Circ. Pump #1 Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Dom. Circ. Pump #2 Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Dom. Circ. Pump #1 Start/Stop	DO	COV	12 Hours	3 days	N/A		
Dom. Circ. Pump #2 Start/Stop	DO	COV	12 Hours	3 days	N/A		
Domestic HW Start/Stop	DO	COV	12 Hours	3 days	N/A		

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
System HWS Temperature	AI	15 min	12 hours	3 days	C	±5°F from SP	10 Min
System HWR Temperature	AI	15 min	12 hours	3 days	M	±15°F from SP	300 Min
HX-1 Entering Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-2 Entering Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-2 Leaving Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
System Flow (GPM)	AI	15 min	12 hours	3 days	N/A		
System Differential Pressure	AI	15 min	12 hours	3 days	P	±10% from SP	8 Min

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
				3 days			
HW Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 1 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 2 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #1 1/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #1 2/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #2 1/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #2 2/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station Bypass Valve Position	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 1 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HW Pump 2 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HWR #1 Valve	DO	COV	12 Hours	3 days	N/A		
HWR #2 Valve	DO	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

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational 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		
Secondary Loop Differential Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Secondary Loop Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Supply Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Return Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Tonnage	AI	15 Minutes	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
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
Secondary Loop Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Secondary 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		
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
Refrigerant Detector	DI	COV	12 Hours	3 days	C	True	10 Min
Refrigerant Exhaust Fan Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Emergency Shutdown	DI	COV	12 Hours	3 days	P	True	1 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		

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Secondary Loop Pump 1 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Secondary 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		
Secondary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary 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		
Refrigerant Exhaust Fan Start / Stop	DO	COV	12 Hours	3 days	N/A		

Condenser Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 1 Condenser Entering Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Condenser Leaving Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Condenser Entering Temp	AI	15 Minutes	12 Hours	3 days	N/A		

Condenser Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 2 Condenser Leaving Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Supply Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Return Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Basin Temp	AI	15 Minutes	12 Hours	3 days	P	< 45 oF	10 Min
Cooling Tower 2 Supply Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 2 Return Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 2 Basin Temp	AI	15 Minutes	12 Hours	3 days	P	< 45 oF	10 Min
Condenser Water Supply Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Condenser Water Return Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Outdoor Air Wet Bulb	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Fan Status	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Cooling Tower 1 Basin Heat	DI	COV	12 Hours	3 days	N/A		
Cooling Tower 1 Heat Trace	DI	COV	12 Hours	3 days	N/A		
Cooling Tower 2 Fan Status	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Cooling Tower 2 Basin Heat	DI	COV	12 Hours	3 days	N/A		
Cooling Tower 2 Heat Trace	DI	COV	12 Hours	3 days	N/A		
Chiller 1 Isolation Valve	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Chiller 2 Isolation Valve	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Condenser Water Pump 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	1 min

Condenser Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Condenser Water Pump 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Chiller 1 Condenser Bypass Valve	AO	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Condenser Bypass Valve	AO	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Bypass Valve	AO	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Fan Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 2 Bypass Valve	AO	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 2 Fan Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Fan Start / Stop	DO	COV	12 Hours	3 days	N/A		
Cooling Tower 2 Fan Start / Stop	DO	COV	12 Hours	3 days	N/A		
Condenser Water Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Condenser Water Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		

Steam Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Boiler 1 Steam Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Boiler 1 Steam Temperature	AI	15 Minutes	12 Hours	3 days	N/A		

Steam Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Boiler 1 Fire Signal	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Steam Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Boiler 2 Steam Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Fire Signal	AI	15 Minutes	12 Hours	3 days	N/A		
System Steam Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Boiler 1 Enable	DI	COV	12 Hours	3 days	N/A		
Boiler 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Boiler 1 Alarm	DI	COV	12 Hours	3 days	C	True	1 Min
Boiler 1 on Fuel Oil	DI	COV	12 Hours	3 days	N/A		
Boiler 1 Low Water Alarm	DI	COV	12 Hours	3 days	C	True	5 Min
Boiler 1 High Water Alarm	DI	COV	12 Hours	3 days	C	True	5 Min
Boiler 1 Feed Pump	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Enable	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Boiler 2 Alarm	DI	COV	12 Hours	3 days	C	True	1 Min
Boiler 2 on Fuel Oil	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Low Water Alarm	DI	COV	12 Hours	3 days	C	True	5 Min
Boiler 2 High Water Alarm	DI	COV	12 Hours	3 days	C	True	5 Min
Boiler 2 Feed Pump	DI	COV	12 Hours	3 days	N/A		
Combustion Damper Status	DI	COV	12 Hours	3 days	P	Status <> Command	5 min
Condensate Recovery Pump Status	DI	COV	12 Hours	3 days	P	Status <> Command	5 min



Steam Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Boiler 1 Feed Pump Start / Stop	DO	COV	12 Hours	3 days	N/A		
Boiler 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Combustion Damper Command	DO	COV	12 Hours	3 days	N/A		
Condensate Recovery Pump Start / Stop	DO	COV	12 Hours	3 days	N/A		

Hot Water Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Outside Air Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 1 Fire Signal	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 1 Entering Water Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 1 Leaving Water Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Fire Signal	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Entering Water Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Leaving Water Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Hot Water Supply Temperature	AI	15 Minutes	12 Hours	3 days	P	±5 oF from SP	10 Min

Hot Water Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Hot Water Return Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Differential Pressure	AI	15 Minutes	12 Hours	3 days	C	±5% from SP	10 Min
Lead Boiler	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 1 Enable	DI	COV	12 Hours	3 days	N/A		
Boiler 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Boiler 1 Isolation Valve	DI	COV	12 Hours	3 days	N/A		
Boiler 1 on Fuel Oil	DI	COV	12 Hours	3 days	N/A		
Boiler 1 Alarm	DI	COV	12 Hours	3 days	C	True	1 Min
Boiler 2 Enable	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Boiler 2 Isolation Valve	DI	COV	12 Hours	3 days	N/A		
Boiler 2 on Fuel Oil	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Alarm	DI	COV	12 Hours	3 days	C	True	1 Min
Combustion Dampers Open	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Primary Pump 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Primary Pump 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Secondary Pump 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Secondary Pump 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min

Hot Water Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Primary Pump 1 VFD Speed	AO	COV	12 Hours	3 days	N/A		
Primary Pump 2 VFD Speed	AO	COV	12 Hours	3 days	N/A		
Secondary Pump 1 VFD Speed	AO	COV	12 Hours	3 days	N/A		
Secondary Pump 2 VFD Speed	AO	COV	12 Hours	3 days	N/A		
Hot Water System Enable	DO	COV	12 Hours	3 days	N/A		
Combustion Dampers Command	DO	COV	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		
Secondary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		

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

<b>SYSTEM</b>		
<b>Sensor</b>	<b>Calibration Frequency</b>	<b>O&amp;M Calibration Procedure Reference</b>
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.

<b>AIR HANDLING UNIT AHU-1</b>				
<b>Control Reference</b>	<b>Proportional Constant</b>	<b>Integral Constant</b>	<b>Derivative Constant</b>	<b>Interval</b>
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 Contractor shall provide training and demonstration as required by other Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 sections. The Training and Demonstration shall include, but is not limited to, the following:
  - 1. Review the Contract Documents.
  - 2. Review installed systems, subsystems, and equipment.
  - 3. Review instructor qualifications.
  - 4. Review instructional methods and procedures.
  - 5. Review training module outlines and contents.
  - 6. Review course materials (including operation and maintenance manuals).
  - 7. Review and discuss locations and other facilities required for instruction.
  - 8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
  - 9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.
- C. Training Module Submittals: The Contractor shall submit the following information to the VA and the Commissioning Agent:
  - 1. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module. At completion of training, submit two complete training manuals for VA's use.
  - 2. Qualification Data: Submit qualifications for facilitator and/or instructor.
  - 3. Attendance Record: For each training module, submit list of participants and length of instruction time.

4. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
5. Demonstration and Training Recording:
  - a. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
  - b. Video Format: Provide high quality color DVD color on standard size DVD disks.
  - c. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
  - d. Narration: Describe scenes on video recording by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
  - e. Submit two copies within seven days of end of each training module.
6. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

D. Quality Assurance:

1. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
2. Instructor Qualifications: A factory authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
3. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

## E. Training Coordination:

1. Coordinate instruction schedule with VA's operations. Adjust schedule as required to minimize disrupting VA's operations.
2. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
3. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by the VA.

## F. Instruction Program:

1. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - a. Fire protection systems, including fire alarm, fire pumps, and fire suppression systems.
  - b. Intrusion detection systems.
  - c. Conveying systems, including elevators, wheelchair lifts, escalators, and automated materials handling systems.
  - d. Medical equipment, including medical gas equipment and piping.
  - e. Laboratory equipment, including laboratory air and vacuum equipment and piping.
  - f. Heat generation, including boilers, feedwater equipment, pumps, steam distribution piping, condensate return systems, heating hot water heat exchangers, and heating hot water distribution piping.
  - g. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping.
  - h. HVAC systems, including air handling equipment, air distribution systems, and terminal equipment and devices.
  - i. HVAC instrumentation and controls.
  - j. Electrical service and distribution, including switchgear, transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
  - k. Packaged engine generators, including synchronizing switchgear/switchboards, and transfer switches.
  - l. Lighting equipment and controls.
  - m. Communication systems, including intercommunication, surveillance, nurse call systems, public address, mass

evacuation, voice and data, and entertainment television equipment.

- n. Site utilities including lift stations, condensate pumping and return systems, and storm water pumping systems.
- G. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participants are expected to master. For each module, include instruction for the following:
1. Basis of System Design, Operational Requirements, and Criteria:
    - Include the following:
      - a. System, subsystem, and equipment descriptions.
      - b. Performance and design criteria if Contractor is delegated design responsibility.
      - c. Operating standards.
      - d. Regulatory requirements.
      - e. Equipment function.
      - f. Operating characteristics.
      - g. Limiting conditions.
      - H, Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project Record Documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  4. Operations: Include the following, as applicable:

- a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.
- H. Training Execution:



1. Preparation: Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual. Set up instructional equipment at instruction location.
  2. Instruction:
    - a. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Department of Veterans Affairs for number of participants, instruction times, and location.
    - b. Instructor: Engage qualified instructors to instruct VA's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
      - 1) The Commissioning Agent will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
      - 2) The VA will furnish an instructor to describe VA's operational philosophy.
      - 3) The VA will furnish the Contractor with names and positions of participants.
  3. Scheduling: Provide instruction at mutually agreed times. For equipment that requires seasonal operation, provide similar instruction at start of each season. Schedule training with the VA and the Commissioning Agent with at least seven days' advance notice.
  4. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, or a written, performance-based test.
  5. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.
- I. Demonstration and Training Recording:
1. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.

2. Video Format: Provide high quality color DVD color on standard size DVD disks.
3. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
4. Narration: Describe scenes on videotape by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

----- END -----

**SECTION 02 41 00**  
**DEMOLITION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 RELATED WORK:**

- A. NOTE USED . B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- H. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.
- I. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7, INFECTION PREVENTION MEASURES.

**1.3 PROTECTION:**

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

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

F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:

1.

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.

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. 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.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 DEMOLITION:**

- A. Completely demolish and remove ALL INTERIOR WALLS, CEILINGS, FLOORING, EQUIPMENT AND CONCRETE SLABS WHERE CHASES ARE REQUIRED FOR INSTALLATION OF THE NEW WORK AND EQUIPMENT. 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.

**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 the 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 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.
- D. Steel Decking: Section 05 31 00, STEEL DECKING.
- E. Composite Steel Deck: Section 05 36 00, COMPOSITE METAL DECKING.
- F. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.

**1.3 QUALITY ASSURANCE:**

- A. Fabricator and erector shall maintain a program of quality assurance in conformance with Section 8, Code of Standard Practice for Steel Buildings and Bridges. Work shall be fabricated in an AISC certified Category Conventional Steel Structures 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 Section 7, Code of Standard Practice for Buildings and Bridges, and by Standard Mill Practice - General Information (AISC ASD Manual, Ninth Edition, Page 1-145, except as follows:

- A. Elevation tolerance for column splice points at time member is erected is 10 mm (3/8 inch).
- B. Elevation tolerance for top surface of steel beams and girders at connections to columns at time floor is erected is 13 mm (1/2 inch).
- C. 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: Specification for Structural Steel Buildings -
- B. AISC: Code of Standard Practice for Steel Buildings and Bridges.

**1.7 SUBMITTALS:**

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

**1.8 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Institute of Steel Construction (AISC):

1. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design (Second Edition, 2005)
  2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Second Edition, 1995)
  3. Code of Standard Practice for Steel Buildings and Bridges (2010).
- 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-09.....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
  - A490-10.....Standard Specification for Heat-Treated Steel Structural Bolts 150 ksi Minimum Tensile Strength
  - A500/A500M-10.....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-06.....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 A992.

B. Structural Tubing: ASTM A500, Grade B.

C. Structural Tubing: ASTM A501.

D. Steel Pipe: ASTM A53, Grade B.

E. Bolts, Nuts and Washers:

1. High-strength bolts, including nuts and washers: ASTM A325 unless  
otherwise noted on drawings.

2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.

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

F. Zinc Coating: ASTM A123.

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

## **PART 3 - EXECUTION**

### **3.1 CONNECTIONS (SHOP AND FIELD):**

A. Welding: Welding in accordance with AWS D1.1. Welds shall be made only  
by welders and welding operators who have been previously qualified by  
tests as prescribed in AWS D1.1 to perform type of work required.

B. High-Strength Bolts: High-strength bolts tightened to a bolt tension  
not less than proof load given in Specification for Structural Joints  
Using ASTM A325 or A490 Bolts. Tightening done with properly calibrated  
wrenches, by turn-of-nut method or by use of direct tension indicators  
(bolts or washers). Tighten bolts in connections identified as slip-  
critical using Direct Tension Indicators or the turn-of-the-nut method.

Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

### **3.2 FABRICATION:**

Fabrication in accordance with Chapter M, Specification for Steel Buildings -Load and Resistance Factor Design.

### **3.3 SHOP PAINTING:**

- A. General: Shop paint steel with primer in accordance with Section 6, Code of Standard Practice for Steel Buildings and Bridges.
- B. Shop paint for steel surfaces is specified in Section 09 91 00, PAINTING.
- 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.
- E. Zinc Coated (Hot Dip Galvanized) per ASTM A123 (after fabrication):  
Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.

### **3.4 ERECTION:**

- A. General: Erection in accordance with Section 7, Code of Standard Practice for Steel Buildings and Bridges.
- B. Temporary Supports: Temporary support of structural steel frames during erection in accordance with Section 7, Code of Standard Practice for Steel Buildings and Bridges.

### **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 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. T

1.. Exterior non-load-bearing steel stud curtain wall.

**1.2 RELATED WORK:**

A. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.

B. Open web steel joists: Section 05 21 00, STEEL JOIST FRAMING.

C. Non-load-bearing metal stud framing assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

D. 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.

C. Structural Performance: Engineer, fabricate, and erect cold-formed metal framing to withstand design loads within limits and under conditions required.

1. Design Loads: As indicated.

2. Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Non-load-Bearing Curtain wall: Lateral deflection of 1/240 of the wall height.

bc. Roof Trusses: Vertical deflection of 1/240 of the span.

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

#### **1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- 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 G90 //, with a yield of 340 MPa (50 ksi) minimum.
- B. Galvanizing Repair Paint: MIL
- D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents,

complying with ASTM C1107, with fluid consistency and a 30 minute working time.

## 2.2 WALL FRAMING:

A. Steel Studs: 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: Unpunched .

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

1. Design Uncoated-Steel Thickness: Matching steel studs.

2. Flange Width: Manufacturer's standard deep flange where indicated, standard flange elsewhere.

## 2.3 FRAMING ACCESSORIES:

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

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

1. Supplementary framing.

2. Bracing, bridging, and solid blocking.

3. Web stiffeners.

4. Gusset plates.
5. Deflection track and vertical slide clips.
6. Stud kickers and girts.
7. Joist hangers and end closures.
8. Reinforcement plates.

**2.5 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.

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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.
- B. Spray applied fireproofing: Section 07 81 00, APPLIED FIREPROOFING
- 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 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**

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**

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
- C. Factory Mutual Engineering and Research Corporation (FM):
  - Annual Issue Approval Guide Building Materials
- D. Underwriters Laboratories, Inc. (UL):
  - Annual Issue Building Materials Directory
  - Annual Issue Fire Resistance Directory
  - 1479-10.....Fire Tests of Through-Penetration Firestops
- E. Warnock Hersey (WH):
  - Annual Issue Certification Listings

**PART 2 - PRODUCTS****2.1 FIRESTOP SYSTEMS**

- A. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 100 mm (4 in) nominal pipe or 0.01 m<sup>2</sup> (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.
- 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 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. Door Hardware: Section 08 71 00, DOOR HARDWARE.

**1.3 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

**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 Thermal Transmittance of Steel Door and Frame Assemblies  
128-1997 Acoustical Performance for Steel Door and Frame Assemblies  
A250.8-03 Standard Steel Doors and Frames

## E. American Society for Testing and Materials (ASTM):

A167-99(R2004).....Stainless and Heat-Resisting Chromium-Nickel  
Steel Plate, Sheet, and Strip  
A568/568-M-07.....Steel, Sheet, Carbon, and High-Strength, Low-  
alloy, Hot-Rolled and Cold-Rolled  
A1008-08.....Steel, sheet, Cold-Rolled, Carbon, Structural,  
High Strength Low Alloy and High Strength Low  
Alloy with Improved Formability  
E90-04.....Laboratory Measurement of Airborne Sound  
Transmission Loss of Building Partitions

## F. The National Association Architectural Metal Manufacturers (NAAMM):

Metal Finishes Manual (1988 Edition)

## G. National Fire Protection Association (NFPA):

80-09.....Fire Doors and Fire Windows

## H. Underwriters Laboratories, Inc. (UL):

Fire Resistance Directory

**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. Prime Paint: Paint that meets or exceeds the requirements of A250.8.



## 2.2 FABRICATION GENERAL

### A. GENERAL:

1. follow sdi a250.8 for fabrication of standard steel doors, except as specified otherwise. doors to receive hardware specified in section 08 71 00, door hardware. tolerances as per sdi a250.8. thickness, 44 mm (1-3/4 inches), unless otherwise shown.
2. close top edge of exterior doors flush and seal to prevent water intrusion.
3. when vertical steel stiffeners are used for core construction, fill spaces between stiffeners with mineral fiber insulation.
- b. standard duty doors: sdi a250.8, level 1, model 2 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: SDI A250.8, Level 2, Model 2 of size and design shown. Core construction types a, d, or f, for interior doors, and, types b, c, e, or f, for exterior doors.

D. Extra Heavy Duty Doors: SDI A250.8, Level 3, Model 2 of size and design shown. Core construction Types d or f, for interior doors, and Types b, c, e, or f, for exterior doors. Use for detention doors, stairwell doors and security doors. See additional requirements for detention doors, under paragraph "Custom Hollow Metal Doors.

### E. Smoke Doors:

1. Close top and vertical edges flush.
2. Provide seamless vertical edges.
3. Apply Steel astragal to the meeting stile 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.

### F. 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.

**METAL FRAMES**

## A. General:

1. SDI A250.8, 1.3 mm (0.053 inch) thick sheet steel, types and styles as shown or scheduled.
2. Frames for exterior doors: Fabricate from 1.7 mm (0.067 inch) thick galvanized steel conforming to ASTM A525.
3. Frames for labeled fire rated doors and windows .
  - 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 lead-lined doors:
  - a. Frames for doors 900 mm (3 feet) or less in width and having lead lining of 1 mm or less in thickness, and not shown to have structural steel supports: Minimum 1.7 mm (0.067 inch) thick.
  - b. Frames for doors over 900 mm (3 feet) in width or having lead-lining more than 1 mm in thickness shown to be supported by and attached to structural steel subframes: Minimum 1.3 mm (0.053 inch) thick.
  - c. Lead-lining and its application are specified in Section 13 49 00, RADIATION PROTECTION.

74. Knocked-down frames are not acceptable.

## B. Reinforcement and Covers:

1. SDI A250.8 for, minimum thickness of steel reinforcement welded to back of frames.
2. Provide mortar guards securely fastened to back of hardware reinforcements except on lead-lined frames.

## C. Terminated Stops: SDI 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.

D. Frame Anchors:

1. Floor anchors:

- a. 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.

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.
- 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.
- 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.

**2.6 SHOP PAINTING**

SDI 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

C. Jamb Anchors:

3. Secure anchors to sides of studs with two fasteners through anchor tabs. Use steel drill screws to steel studs.

- D. Install anchors for labeled fire rated doors to provide rating as required.

- F. Overhead Bracing (Lead Lined Frames): Where jamb extensions extend to structure above, anchor clip angles with not less than two, 9 mm (3/8 inch) expansion bolts or power actuated drive pins to concrete slab. Weld to steel overhead members.

**3.2 INSTALLATION OF DOORS AND APPLICATION OF HARDWARE**

Install frames, doors and hardware as specified in Section 08 11 13, HOLLOW METAL DOORS AND FRAMES .

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**SECTION 08 14 00  
INTERIOR WOOD DOORS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies interior flush doors with prefinish, prefit option.
- B. Section includes fire rated doors, sound retardant doors, smoke, and dutch doors.

**1.2 RELATED WORK**

- A. Metal door frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- B. Doors and frames of a forced entry/ballistic resistant rated: Section 08 34 53, SECURITY DOORS AND FRAMES.
- C. Overhead doors including loading docks: Section 08 33 00, COILING DOORS AND GRILLES.
- D. Windows and frames of a forced entry/ballistic resistant rated: Section 08 56 53, SECURITY WINDOWS
- E. Door hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- F. 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.
- G. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- H. Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- I. Metal louvers: Section 08 90 00, LOUVERS AND VENTS.
- J. Lead lined wood door: Section 13 49 00, RADIATION PROTECTION.
- K. Card readers and biometric devices: Section 28 13 00, ACCESS CONTROL
- L. Intrusion alarm: Section 28 16 11, INTRUSION DETECTION SYSTEM
- M. Security monitors: Section 28 51 00, SECURITY CONTROL CENTER

**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.
- C. Shop Drawings:
  - 1. Show every door in project and schedule location in building.



- 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):  
 80-07.....Protection of Buildings from Exterior Fire  
 252-08.....Fire Tests of Door Assemblies
- D. ASTM International (ASTM):  
 E90-04.....Laboratory Measurements of Airborne Sound  
 Transmission Loss

## **PART 2 - PRODUCTS**

### **2.1 FLUSH DOORS**

- A. General:
1. Meet requirements of WDMA I.S.1-A, Extra Heavy Duty.
  2. Adhesive: Type II
  3. Thickness: 45 mm (1-3/4 inches) unless otherwise shown or specified.
- B. Face Veneer:
1. In accordance with WDMA I.S.1-A.
  2. One species throughout the project unless scheduled or otherwise shown.
  4. For painted finishes: Custom Grade, mill option close grained hardwood, premium or medium density overlay. Do not use Lauan.
  5. Factory sand doors for finishing.
- C. Wood for stops, louvers, muntins and moldings of flush doors required to have transparent finish:
1. Solid Wood of same species as face veneer, except maple may be used on birch doors.
  2. Glazing:
    - a. On non-labeled doors use applied wood stops nailed tight on room side and attached on opposite side with flathead, countersunk wood screws, spaced approximately 125 mm (5 inches) on centers.
    - b. Use stainless steel or dull chrome plated brass screws for exterior doors.
  3. Wood Louvers:
    - a. Door manufacturer's standard product, fabricated of solid wood sections.
    - b. Wood Slats: Not less than 5 mm (3/16 inch) thick.

- c. Stiles routed out to receive slats.
  - d. Secure louvers in prepared cutouts with wood stops.
- D. 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.
- 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. STC Rating of the door assembly in place when tested in accordance with ASTM E90 by an independent nationally recognized acoustical testing laboratory not less than 36.
  - 3. Accessories:
    - a. Frame Gaskets: Continuous closed cell sponge neoprene with stop adjusters.
    - b. Automatic Door Bottom Seal:
      - 1) Steel spring operated, closed cell sponge neoprene metal mounted removable in extruded aluminum housing with a medium matte 0.1 mm (4.0 mil) thick clear Anodized finish.
      - 2) Concealed or Surface Mounted.
- H. Dutch Doors:
- 1. Consist of two sections, each fabricated as specified for flush doors.
  - 2. Construct shelf as detailed, from clear hardwood stock, or laminated plastic door shelf, same species as face veneer of door.
  - 3. Place shelf on top of lower section of door and support as shown with a pair of wood or wrought steel brackets.
  - 4. Prime steel brackets for finish painting.

## 2.2 STILE AND RAIL DOORS

- A. Meeting requirements of WDMA I.S.6A
- B. Ponderosa pine doors of size and design shown.
- C. Grade: Premium.

**D. Door Panels:**

1. Grain of face of panels parallel with longest dimensions of panel.
2. Flat panels: Veneered composite core, not less than 6 mm (5/8 inch) thick.
3. Raised panels: Unless otherwise shown, thickness of raised panels not less than the following:
  - a. For 35 mm (1-3/8 inch) and 45 mm (1-3/4 inch) thick doors: 28 mm (1-1/8 inch) thick
  - b. For 57 mm (2-1/4 inch) thick doors: 41 mm (1-5/8 inch) thick
4. Where armor plate is required in connection with paneled doors, provide panels with plywood fillers, glued in place, and finished.

**E. Stops and Molds:**

1. Solid sticking both sides, of same material as stiles and rails, coped at intersections.
2. Glazed openings applied wood stops nailed on interior side of door.

**F. Louvers: Size as shown.****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.

**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 undercut where shown.
- 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**

Install doors and hardware as specified in this Section.

**3.3 DOOR PROTECTION**

- A. As door installation is completed, place polyethylene bag or cardboard shipping container over door and tape in place.
- B. Provide protective covering over knobs and handles in addition to covering door.
- C. Maintain covering in good condition until removal is approved by Resident Engineer.

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**SECTION 08 31 13  
ACCESS DOORS AND FRAMES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

Section specifies access doors or panels.

**1.2 RELATED WORK:**

- A. Wire mesh and screen access doors: Section 05 50 00, METAL FABRICATIONS
- B. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.
- C. Access doors in acoustical ceilings: Section 09 51 00, ACOUSTICAL CEILINGS.
- D. 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-2004).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
  - A1008-07.....Steel Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy
- C. American Welding Society (AWS):
  - D1.3-98.....Structural Welding Code Sheet Steel
- D. National Fire Protection Association (NFPA):
  - 80-06.....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 stainless 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 1.5 mm (0.0598 inch) thick stainless steel sheet.
2. Reinforce to maintain flat surface.

## B. Frame:

1. Form of 1.5 mm (0.0598 inch) thick stainless 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 stainless steel sheet to form a 25 mm (one inch) deep recessed panel 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: Baked-on prime coat over a protective phosphate coating.
- C. Stainless Steel: No. 4 for exposed surfaces.

**2.6 SIZE:**

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

**PART 3 - EXECUTION****3.1 LOCATION:**

- A. Provide access panels or doors wherever any valves, traps, dampers, cleanouts, and other control items of mechanical, electrical and conveyor work are concealed in wall or partition, or are above ceiling of gypsum board or plaster.
- B. Use fire rated doors in fire rated partitions and ceilings.
- C. Use flush panels in partitions and gypsum board or plaster ceilings, except lay-in acoustical panel ceilings or upward access acoustical tile ceilings.
- D. Use recessed panel access doors in the following rooms or spaces.

**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 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
- C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Painting: Section 09 91 00, PAINTING.

**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, if possible, except as otherwise specified:
  - 1. Mortise locksets.
  - 2. Hinges for hollow metal and wood doors.
  - 3. Surface applied overhead door closers.
  - 4. Exit devices.
  - 5. Floor closers.

**1.4 WARRANTY**

- A. Automatic door operators shall be subject to the terms of FAR Clause 52.24-21, except that the Warranty period shall be two years in lieu of one year for all items except as noted below:
  - 1. Locks, 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.

**1.6 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23 plus 2 copies to the VAMC Locksmith (VISN Locksmith if the VAMC does not have a locksmith).
- B. Hardware Schedule: Prepare and submit hardware schedule in the following form: SEE HARDWARE SCHEDULE IN PAGES THAT FOLLOW

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 COTR for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in COTR's office until all other similar items have been installed in project, at which time the COTR will deliver items on file to Contractor for installation in predetermined locations on the project.

#### **1.8 PREINSTALLATION MEETING**

- A. Convene a preinstallation meeting not less than 30 days before start of installation of door hardware. Require attendance of parties directly affecting work of this section, including Contractor and Installer, Architect, Project Engineer and VA Locksmith, Hardware Consultant, and Hardware Manufacturer's Representative. Review the following:
  - 1. Inspection of door hardware.
  - 2. Job and surface readiness.
  - 3. Coordination with other work.
  - 4. Protection of hardware surfaces.
  - 5. Substrate surface protection.
  - 6. Installation.
  - 7. Adjusting.
  - 8. Repair.
  - 9. Field quality control.
  - 10. Cleaning.

#### **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. Manufacturers' Catalog Number References: Where manufacturers' products are specified herein, products of other manufacturers which are

considered equivalent to those specified may be used. Manufacturers whose products are specified are identified by abbreviations as follows:

Adams-Rite	Adams Rite Mfg. Co.	Pomona, CA
Best	Best Access Systems	Indianapolis, IN
Don-Jo	Don-Jo Manufacturing	Sterling, MA
G.E. Security	GE Security, Inc.	Bradentown, FL
Markar	Markar Architectural Products	Pomona, CA
Pemko	Pemko Manufacturing Co.	Ventura, CA
Rixson	Rixson	Franklin Park, IL
Rockwood	Rockwood Manufacturing Co.	Rockwood, PA
Securitron	Securitron Magnalock Corp.	Sparks, NV
Southern Folger	Southern Folger Detention Equipment Co.	San Antonio, TX
Stanley	The Stanley Works	New Britain, CT
Tice	Tice Industries	Portland, OR
Trimco	Triangle Brass Mfg. Co.	Los Angeles, CA
Zero	Zero Weather Stripping Co.	New York, NY

C. Keying: 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 will be completed by the VA.

1. Supply information regarding key control of cylinder locks to manufacturers of equipment having cylinder type locks. Notify COTA immediately when and to whom keys or keying information is supplied. Return all such keys to the R COTA.

#### 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
- A156.12-05 .....Interconnected Locks and Latches
- A156.13-05.....Mortise Locks and Latches Series 1000
- A156.14-07 .....Sliding and Folding Door Hardware
- A156.15-06.....Release Devices-Closer Holder, Electromagnetic  
and Electromechanical
- A156.16-08.....Auxiliary Hardware
- A156.17-04 .....Self-Closing Hinges and Pivots
- A156.18-06.....Materials and Finishes
- A156.20-06 .....Strap 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
- A156.25-07 .....Electrified Locking Devices
- A156.26-06.....Continuous Hinges
- A156.28-07 .....Master Keying Systems
- A156.29-07 .....Exit Locks and Alarms
- A156.30-03 .....High Security Cylinders
- A156.31-07 .....Electric 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 DOOR CLOSING DEVICES**

- A. Closing devices shall be products of one manufacturer.

### 2.3 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.

#### 2.4 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).



## 2.4 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.

## 2.5 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 Figure 8 Style. 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 Schlage 06A. No substitute lever material shall be accepted. All locks and latchsets shall be furnished with 122.55 mm (4-7/8-inch) curved lip strike and wrought box. At outswing pairs with overlapping astragals, provide flat lip strip with 21mm (7/8-inch) lip-to-center dimension. Lock function F02 shall be furnished with emergency tools/keys for emergency entrance. All lock cases

- installed on lead lined doors shall be lead lined before applying final hardware finish. Furnish armored fronts for all mortise locks. Where mortise locks are installed in high-humidity locations or where exposed to the exterior on both sides of the opening, provide non-ferrous mortise lock case.
2. 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. Locks on designated doors in Psychiatric (Mental Health) areas shall be paddle type with arrow projection covers and be UL Listed. Provide these locks with paddle in the down position on both sides of the door. Locks shall be fabricated of wrought stainless steel.
  5. 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).

## 2.6 KEYS

- A. 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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## 2.7 ARMOR PLATES, KICK PLATES, MOP PLATES AND DOOR EDGING

- A. Conform to ANSI Standard A156.6.
- B. Provide protective plates 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.

## 2.8 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.
- 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.

## 2.9 BASE METALS

- A. Apply specified U.S. Standard finishes on different base metals as following:

Finish	Base Metal
652	Steel
626	Brass or bronze
630	Stainless steel

**PART 3 - EXECUTION****3.1 HARDWARE HEIGHTS**

- A. For existing buildings locate hardware on doors at heights to match existing hardware. The Contractor shall visit the site, verify location of existing hardware and submit locations to VA COTR for approval.
- B. Hardware Heights from Finished Floor:
1. Exit devices centerline of strike (where applicable) 1024 mm (40-5/16 inches).
  2. Locksets and latch sets centerline of strike 1024 mm (40-5/16 inches).
  3. Deadlocks centerline of strike 1219 mm (48 inches).
  4. Hospital arm pull 1168 mm (46 inches) to centerline of bottom supporting bracket.
  5. Centerline of door pulls to be 1016 mm (40 inches).
  6. Push plates and push-pull shall be 1270 mm (50 inches) to top of plate.
  7. Push-pull latch to be 1024 mm (40-5/16 inches) to centerline of strike.
  8. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.

**3.2 INSTALLATION**

- A. Closer devices, including those with hold-open features, shall be equipped and mounted to provide maximum door opening permitted by building construction or equipment. Closers shall be mounted on side of door inside rooms, inside stairs, and away from corridors. 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:**

<b>Door Thickness</b>	<b>Door Width</b>	<b>Hinge Height</b>
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 COTR. 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. . Deliver all lock sets unkeyed to COTA.

### 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.

ELECTRIC HARDWARE ABBREVIATIONS LEGEND:

ADO = Automatic Door Operator

EMCH = Electro-Mechanical Closer-Holder

MHO = Magnetic Hold-Open (wall- or floor-mounted)

### Hardware Sets

SEE HARDWARE SETS IN DOOR SCHEDULE SHOWN ON DRAWINGS

- - - E N D - - -

**SECTION 08 71 13**  
**AUTOMATIC DOOR OPERATORS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies equipment, controls and accessories for automatic operation of swing and sliding doors.

**1.2 RELATED WORK**

- A. B. Door hardware; Section 08 71 00, DOOR HARDWARE.
- C. Section 28 13 00, ACCESS CONTROL.
- D. Glass and glazing of doors and frames; Section 08 80 00, GLAZING.
- E. Electric general wiring, connections and equipment requirements; Division 26, ELECTRICAL.
- F. Section 28 31 00, FIRE DETECTION AND ALARM.

**1.3 QUALITY ASSURANCE**

- A. Automatic door operators, controls and other equipment shall be products of a manufacturer regularly engaged in manufacturing such equipment for a minimum of three years.
- B. One type of automatic door equipment shall be used throughout the building.
- C. Equipment installer shall have specialized experience and shall be approved by the manufacturer.

**1.4 WARRANTY**

- A. Automatic door operators shall be subject to the terms of the "Warranty of Construction", FAR clause 52.246-21, except that the Warranty period shall be two years in lieu of one year.

**1.5 MAINTENANCE MANUALS**

- A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS", furnish maintenance manuals and instructions on automatic door operators.

**1.6 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's literature and data describing operators, power units, controls, door hardware and safety devices.
- C. Shop Drawings:
  - 1. Showing location of controls and safety devices in relationship to each automatically operated door.



- 2. Showing layout, profiles, product components, including anchorage, accessories, as applicable.
- 3. Submit templates, wiring diagrams, fabrication details and other information to coordinate the proper installation of the automatic door operators.
- D. Submit in writing to Resident Engineer that items listed in Article 1.3 are in compliance.

**1.7 DESIGN CRITERIA**

- A. As a minimum automatic door equipment shall comply with the requirements of BHMA 156.10. Except as otherwise noted on drawings, provide operators which will move the doors from the fully closed to fully opened position in three seconds maximum time interval, when speed adjustment is at maximum setting.
- B. Equipment: Conforming to UL 325. Provide key operated power disconnect wall switch for each door installation.
- C. Electrical Wiring, Connections and Equipment: Provide all motor, starter, controls, associated devices, and interconnecting wiring required for the installation. Equipment and wiring shall be as specified in Division 26, ELECTRICAL.

**1.8 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Builders Hardware Manufacturers Association, Inc. (BHMA):  
A156.10-05.....Power Operated Pedestrian Doors (BHMA 1601)
- C. National Fire Protection Association (NFPA):  
101-09.....Life Safety Code
- D. Underwriters Laboratory (UL):  
325-10.....Door, Drapery, Gate, Louver, and Window  
Operators and Systems

**1.9 DELIVERY AND STORAGE**

- A. Delivery shall be in factory's original, unopened, undamaged container with identification labels attached.

**PART 2 - PRODUCTS****2.1 SWING DOOR OPERATORS**

- A. General: Swing door operators shall be of institutional type, door panel size 600 mm to 1250 mm (2'-0" to 5'-0") width, weight not to exceed 300 kg (600 pounds), electric operated for overhead mounting within the header or transom. Furnish metal mounting supports, brackets and other accessories necessary for the installation of operators at the head of the door frames. The motor on automatic door operator shall be provided with an interlock so that the motor will not operate when doors are electrically locked from opening.
- B. Operators shall have checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle. Operators shall be capable of recycling doors instantaneously to full open position from any point in the closing cycle when control switch is activated. Operators shall, when automatic power is interrupted or shut-off, permit doors to easily open manually without damage to automatic operator system.
- C. Operator, enclosed in housing, shall open door by energizing motor and shall stop by electrically reducing voltage and stalling motor against mechanical stop. Door shall close by means of spring energy, and close force shall be controlled by gear system and motor being used as dynamic break without power, or controlled by hydraulic closer in electro-hydraulic operators. System shall operate as manual door control in event of power failure. Opening and closing speeds shall be adjustable:
1. Operator Housing: Housing shall be a minimum of 112 mm (4-1/2 inches) wide by 140 mm (5.5 inches) high aluminum extrusions with enclosed end caps for application to 100 mm (4 inches) and larger frame systems. All structural sections shall have a minimum thickness of 3.2 mm (0.125 inch) and be fabricated of a minimum of 6063-T5 aluminum alloy.
  2. Power Operator: Completely assembled and sealed unit which shall include gear drive transmission, mechanical spring and bearings, all located in aluminum case and filled with special lubricant for extreme temperature conditions. Complete unit shall be rubber mounted with provisions for easy maintenance and replacement, without removing door from pivots or frame.

3. Connecting hardware shall have drive arm attached to door with a pin linkage rotating in a self-lubricating bearing. Door shall not pivot on shaft of operator.
4. Electrical Control: Operator shall have a self contained electrical control unit, including necessary transformers, relays, rectifiers, and other electronic components for proper operation and switching of power operator. All connecting harnesses shall have interlocking plugs.

## **2.2 MICROPROCESSOR CONTROLS**

- A. The system shall include a multi-function microprocessor control providing adjustable hold open time (1-30 seconds), LED indications for sensor input signals and operator status and power assist close options. Control shall be capable of receiving activation signals from any device with normally open dry contact output. All activation modes shall provide fully adjustable opening speed:
- B. The door shall be held open by low voltage applied to the continuous duty motor. The control shall include an adjustable safety circuit that monitors door operation and stops the opening direction of the door if an obstruction is sensed. The motor shall include a recycle feature that reopens the door if an obstruction is sensed at any point during the closing cycle. The control shall include a standard three position key switch with functions for ON, OFF, and HOLD OPEN, mounted on operator enclosure, door frame, or wall, as indicated in the architectural drawings.

## **2.3 SLIDING DOOR OPERATORS**

- A. General: Sliding doors shall have electric operators, conforming to BHMA A156.10 and the following requirements as applicable. Assembly shall be single or bi-parting sliding doors as shown on drawings.
- B. Door Operation: Doors shall be opened by electric motor pulling door from closed to open position and shall stop door by electrically reducing voltage and stalling door against mechanical stop. System shall permit manual control of door in event of power failure. Opening and closing speeds shall be adjustable. In compliance with NFPA-101, all door panels shall allow "breakout" to the full open position to provide instant egress at any point in the door's movement.
- C. Operators: Completely assembled and sealed electromechanical operating unit, all located in cast aluminum housing and filled with special lubricant for extreme conditions. Attached to transmission system shall

be a minimum 1/8 Hp "DC" shunt-wound permanent magnet motor with sealed ball bearings. Complete unit shall be rubber mounted with provisions for easy maintenance and replacement. Operators shall have adjustable opening and closing cycle. Housing shall be minimum 6063T-5 alloy aluminum not less than .005 mm (125 inch) minimum thickness, 150 mm by 200 mm (6 inch wide by 8 inch high).

- D. Sliding Door Hardware Guide Rollers, Door Carrier: Top door carriers shall ride on steel or delrin rollers incorporating sealed bearings with each door having two support rollers and one anti-rise roller. Each roller shall have a minimum of 9 mm (3/8-inch) of vertical adjustment with positive mechanical locks. Each door shall also include two urethane covered oil impregnated bearing bottom rollers attached with 5 mm (3/16-inch) thick formed steel guide brackets. Each door carrier supporting a door leaf shall include a vertical steel reinforcing member to prevent sagging when door is swung under breakaway conditions. All carbon steel brackets and fittings shall be plated for corrosion resistance.
- E. Locking Hardware: Do not provide any locking hardware at interior doors not requiring physical security. Provide doors with flush concealed vertical rod panic hardware integrated into the doors where physical security is required and free egress is required at all times. Provide doors with manufacturers' standard hookbolt lock (keyed both sides) where physical security is required and free egress is not required at all times. At doors with access control devices (card readers, etc.), provide doors with electronic deadbolt locking to prevent the doors from manually sliding open.
- F. Door Closers: Provide all breakout or swing-out panels with door closers concealed in the top rail of the door.

#### **2.4 POWER UNITS**

Each power unit shall be self-contained, electric operated and independent of the door operator. Capacity and size of power circuits shall be in accordance with automatic door operator manufacturer's specifications and Division 26 - ELECTRICAL.

#### **2.5 DOOR CONTROLS**

- A. Opening and closing actions of doors shall be actuated by controls and safety devices specified, and conform to ANSI 156.10. Controls shall cause doors to open instantly when control device is actuated; hold

doors in open positions; then, cause doors to close, unless safety device or reactivated control interrupts operation.

B. Manual Controls:

1. Push Plate Wall Switch: Recess type, stainless steel push plate minimum 100 mm by 100 mm (four-inch by four-inch), with 13 mm (1/2-inch) high letters "To Operate Door--Push" engraved on face of plate.

C. Motion Detector: The motion detector may be surface mounted or concealed, to provide a signal to actuate the door operator, and monitor the immediate zone, to detect intrusion by persons, carts or similar objects. The zone which the detector monitors shall be 1500 mm (five feet) deep and 1500 mm (five feet) across, plus or minus 150 mm (six inches) on all dimensions. The maximum response time shall be no less than 25 milliseconds. Unit shall be designed to operate on 24 volts AC. The control shall not be affected by cleaning material, solvents, dust, dirt and outdoor weather conditions.

## 2.6 SAFETY DEVICES

- A. General: Area over which doors swing or slide shall be a safety section and anyone standing in path of door's movement shall be protected by a safety device.
- B. At sliding doors, provide two photoelectric beams mounted at heights of 600 mm (24 inches) and 1200 mm (48 inches) in the door frame on sliding doors. Provide overhead safety presence sensors at door head on each side of the opening. Beams shall parallel door openings to prevent doors from closing when anyone is in the center of the door or doors. When beams are activated, doors shall recycle to full open position. Actuation shall include a motion detector mounted on each side of the door for detection of traffic in each direction.
- C. Each swing door shall have installed on the pull side a presence sensor to detect any person standing in the door swing path and prevent the door from opening.
- D. Time delay switches shall be adjustable between 3 to 60 seconds and shall control closing cycle of doors.
- E. Decals with sign "In" or "Do Not Enter" shall be installed on both faces of each door where shown.

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

- A. Coordinate installation of equipment with other related work. Manual controls and power disconnect switches shall be recessed or semi-flush mounted in partitions. Secure operator components to adjacent construction with suitable fastenings. Conceal conduits, piping, and electric equipment, in finish work.
- B. Install power units in locations shown. Where units are to be mounted on walls, provide metal supports or shelves for the units. All equipment, including time delay switches, shall be accessible for maintenance and adjustment.
- C. Operators shall be adjusted and must function properly for the type of traffic (pedestrians, carts, stretchers and wheelchairs) expected to pass through doors. Each door leaf of pairs of doors shall open and close in synchronization. On pairs of doors, operators shall allow either door to be opened manually without the other door opening.
- D. Install controls at positions shown and make them convenient for particular traffic expected to pass through openings. Maximum height of push plate wall switches from finished floors shall be 40 inches unless otherwise approved by the Resident Engineer.

**3.2 INSTRUCTIONS**

- A. Following the installation and final adjustments of the door operators, the installer shall fully instruct VA personnel for 2 hours on the operating, servicing and safety requirements for the swing and sliding automatic door operators.
- B. Coordinate instruction to VA personnel with VA Resident Engineer.

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**SECTION 08 80 00**  
**GLAZING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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. Doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS.
4. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
6. Lead glass: Section 13 49 00, RADIATION PROTECTION.

**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.
- bold lettering on each side of glazing with removable label.

**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.

- 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.
- E. Samples:
  - 1. Size: 150 mm by 150 mm (6 inches by 6 inches).

**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.

**1.7 PROJECT CONDITIONS**

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:

**1.9 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):
  - Z97.1-04.....Safety Glazing Material Used in Building -  
Safety Performance Specifications and Methods  
of Test.
- C. American Society for Testing and Materials (ASTM):
  - C1363-05.....Thermal Performance of Building Assemblies, by  
Means of A Hot Box Apparatus
  - C542-05.....Lock-Strip Gaskets.
  - C716-06.....Installing Lock-Strip Gaskets and Infill  
Glazing Materials.



- D. Not Used
- E. Code of Federal Regulations (CFR):
  - 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; 1977, with 1984 Revision.
- F. National Fire Protection Association (NFPA):
  - 80-08.....Fire Doors and Windows.
- G. National Fenestration Rating Council (NFRC)
- H. Safety Glazing Certification Council (SGCC)2009:
  - Certified Products Directory (Issued Semi-Annually).
- I. Underwriters Laboratories, Inc. (UL):
  - 752-06.....Bullet-Resisting Equipment.
- J. Unified Facilities Criteria (UFC):
  - 4-010-01-2007.....DOD Minimum Antiterrorism Standards for Buildings
- K. Glass Association of North America (GANA):
  - Glazing Manual (Latest Edition)
  - Sealant Manual (2008)
- L. American Society of Civil Engineers (ASCE):
  - ASCE 7-10.....Wind Load Provisions

## **PART 2 - PRODUCT**

### **2.1 GLASS**

- A. Use thickness stated unless specified otherwise in assemblies.
- B. Clear Glass:
  - 1. ASTM C1036, Type I, Class 1, Quality q3
  - 2. Thickness, as indicated .

### **2.2 HEAT-TREATED GLASS**

- A. Clear Heat Strengthened Glass:
  - 1. ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
  - 2. Thickness, as indicated.
- C. Clear Tempered Glass:
  - 1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
  - 2. Thickness, as indicated .

## **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.

### **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.
- L. Fire Resistant Glass:
  1. Wire glass: Glaze in accordance with NFPA 80.
  2. Other fire resistant glass: Glaze in accordance with UL design requirements.

**3.12 PROTECTION**

Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

**3.13 GLAZING SCHEDULE****A. Fire Resistant Glass:**

1. Use Fire Resistant Glass without wire mesh in interior fire rated or labeled doors and windows.

**B. Tempered Glass:**

1. Install in full and half glazed doors unless indicated otherwise.
2. Install in storefront, windows, and door sidelights adjacent to doors.
3. Use clear tempered glass on interior side lights and doors, and on exterior doors and sidelights unless otherwise indicated or specified.

**D. Clear Glass:**

1. Interior observation windows not specified otherwise.

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SECTION 09 06 00  
SCHEDULE FOR FINISHES

**PART I - GENERAL**

**1.1 DESCRIPTION**

All finishes are to be provided as scheduled on the drawings.

**1.2 MANUFACTURERS**

Manufacturer's trade names and numbers used herein are only to identify colors, finishes, textures and patterns. Products of other manufacturer's equivalent to colors, finishes, textures and patterns of manufacturers listed that meet requirements of technical specifications will be acceptable upon approval in writing by contracting officer for finish requirements.

**1.3 SUBMITALS**

Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES—provide quadruplicate samples for color approval of materials and finishes specified in this section.

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**SECTION 09 22 16  
NON-STRUCTURAL METAL FRAMING**

**SPEC WRITER NOTE:**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies steel studs wall systems, shaft wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board, plaster bases or other building boards.

**1.2 RELATED WORK**

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.
  - 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.

**1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE**

In accordance with the requirements of ASTM C754.

## 1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society For Testing And Materials (ASTM)
- 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
- C636-06.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
- C645-09.....Non-Structural Steel Framing Members
- C754-09.....Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
- C841-03(R2008).....Installation of Interior Lathing and Furring
- C954-07.....Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
- C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
- E580-09.....Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

## PART 2 - PRODUCTS

### 2.1 PROTECTIVE COATING

Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G-60 minimum, per ASTM 123.

**2.2 STEEL STUDS AND RUNNERS (TRACK)**

- A. ASTM C645, modified for thickness specified and sizes as shown.
  - 1. Use ASTM A525 steel, 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.

**2.3 FURRING CHANNELS**

- A. Rigid furring channels (hat shape): ASTM C645.
- B. Resilient furring channels:
  - 1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
  - 2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.
- C. "Z" Furring Channels:
  - 1. Not less than 0.45 mm (0.0179-inch)-thick 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.

**2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES**

- A. ASTM C754, except as otherwise specified.
- B. For fire rated construction: Type and size same as used in fire rating test.

- C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.
- D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.
- E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.
- F. Tie Wire and Hanger Wire:
  - 1. ASTM A641, soft temper, Class 1 coating.
  - 2. Gage (diameter) as specified in ASTM C754 or ASTM C841.
- G. Attachments for Wall Furring:
  - 1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.

## **2.5 SUSPENDED CEILING SYSTEM FOR GYPSUM BOARD (OPTION)**

- A. Conform to ASTM C635, heavy duty, with not less than 35 mm (1-3/8 inch) wide knurled capped flange face designed for screw attachment of gypsum board.
- B. Wall track channel with 35 mm (1-3/8 inch) wide flange.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION CRITERIA**

- A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be same as that used in fire rating test.
- B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2) of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

### **3.2 INSTALLING STUDS**

- A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.
- B. Space studs not more than 610 mm (24 inches) on center.
- C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.



- D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.
- E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions and insulated exterior wall furring.
- G. Openings:
  - 1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
  - 2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
  - 3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.
- H. Fastening Studs:
  - 1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
  - 2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.
- I. Chase Wall Partitions:
  - 1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
  - 2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).

### **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.
- C. Concrete slabs on steel decking composite construction:
  - 1. Use pull down tabs when available.
  - 2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.
- E. Existing concrete construction exposed or concrete on steel decking:
  - 1. Use power actuated fasteners either eye pin, threaded studs or drive pins for type of hanger attachment required.

2. Install fasteners at approximate mid height of concrete beams or joists. Do not install in bottom of beams or joists.
- G. Installing suspended ceiling system for gypsum board (ASTM C635 Option):
1. Install only for ceilings to receive screw attached gypsum board.
  2. Install in accordance with ASTM C636.
    - a. Install main runners spaced 1200 mm (48 inches) on center.
    - b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
    - c. Install wall track channel at perimeter.
- H. Installing Ceiling Bracing System:
1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm (8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap channels not less than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.
  2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.

### 3.7 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.)

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**SECTION 09 29 00**  
**GYPSUM BOARD**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies installation and finishing of gypsum board.

**1.2 RELATED WORK**

- A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- E. Lead lined wallboard: Section 13 49 00, RADIATION PROTECTION.
- F. Lay in gypsum board ceiling panels: Section 09 51 00, ACOUSTICAL CEILING.

**1.3 TERMINOLOGY**

- A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.
- C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Cornerbead and edge trim.
  - 2. Finishing materials.
  - 3. Laminating adhesive.
  - 4. Gypsum board, each type.
- C. Shop Drawings:
  - 1. Typical gypsum board installation, showing corner details, edge trim details and the like.
  - 2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
  - 3. Typical shaft wall assembly.
  - 4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.
- D. Samples:

- 1. Cornerbead.
- 2. Edge trim.
- 3. Control joints.

E. Test Results:

- 1. Fire rating test, each fire rating required for each assembly.
- 2. Sound rating test.

**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
- C1177-06.....Glass Mat Gypsum Substrate for Use as Sheathing
- C1658-06.....Glass Mat Gypsum Panels
- 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 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. Coreboard or Shaft Wall Liner Panels.
  - 1. ASTM C1396, Type X.
  - 2. ASTM C1658: Glass Mat Gypsum Panels,
  - 3. Coreboard for shaft walls 300, 400, 600 mm (12, 16, or 24 inches) wide by required lengths 25 mm (one inch) thick with paper faces treated to resist moisture.
- C. Water Resistant Gypsum Backing Board: ASTM C620, Type X, 16 mm (5/8 inch) thick.
- D. 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.

### **2.2 GYPSUM SHEATHING BOARD**

- A. ASTM C1396, Type X, water-resistant core, 16 mm (5/8 inch) thick.
- B. ASTM C1177, Type X.

### **2.3 ACCESSORIES**

- A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.
- B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

### **2.4 FASTENERS**

- A. ASTM C1002 and ASTM C840, except as otherwise specified.
- B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).
- C. Select screws of size and type recommended by the manufacturer of the material being fastened.
- D. For fire rated construction, type and size same as used in fire rating test.
- E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

**2.5 FINISHING MATERIALS AND LAMINATING ADHESIVE**

ASTM C475 and ASTM C840. Free of antifreeze, vinyl adhesives, preservatives, biocides and other VOC. Adhesive shall contain a maximum VOC content of 50 g/l.

**PART 3 - EXECUTION****3.1 GYPSUM BOARD HEIGHTS**

- A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:
  - 1. Two sides of partitions:
    - a. Fire rated partitions.
    - b. Smoke partitions.
    - c. Sound rated partitions.
    - d. Full height partitions shown (FHP).
    - e. Corridor partitions.
  - 2. One side of partitions or furring:
    - a. Inside of exterior wall furring or stud construction.
    - b. Room side of room without suspended ceilings.
    - c. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.
  - 3. Extend all layers of gypsum board construction used for fireproofing of columns from floor to underside of structure overhead, unless shown otherwise.
- B. In locations other than those specified, extend gypsum board from floor to heights as follows:
  - 1. Not less than 100 mm (4 inches) above suspended acoustical ceilings.
  - 2. At ceiling of suspended gypsum board ceilings.
  - 3. At existing ceilings.

**3.2 INSTALLING GYPSUM BOARD**

- A. Coordinate installation of gypsum board with other trades and related work.
- B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.
- C. Moisture and Mold-Resistant Assemblies: Provide and install moisture and mold-resistant glass mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 where shown and in locations which might be subject to moisture exposure during construction.



- D. Use gypsum boards in maximum practical lengths to minimize number of end joints.
- E. Bring gypsum board into contact, but do not force into place.
- F. Ceilings:
  - 1. For single-ply construction, use perpendicular application.
  - 2. For two-ply 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.
  - 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.

### 3.4 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.
- 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.
- F. Elevator Shafts:
  - 1. 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.
  - 2. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

**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 and sound rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier, fire rated and sound rated construction Sanding is not required of non decorated surfaces.

**3.6 REPAIRS**

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.
- B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.
- D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non decorated surface to provide smoke tight construction fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction.

- - - E N D - - -

**SECTION 09 30 13**  
**CERAMIC/PORCELAIN TILING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies ceramic, porcelain and quarry tile, marble thresholds and window stools, terrazzo divider strips, waterproofing membranes for thin-set applications, crack isolation membranes, tile backer board.

**1.2 RELATED WORK**

- B. Color, texture and pattern of field tile and trim shapes, size of field tile, trim shapes, and color of grout specified: SEE ROOM FINISH SCHEDULE SHOWN ON DRAWINGS.
  
- D. Metal and resilient edge strips at joints with new resilient flooring, and carpeting: Section 09 65 19, RESILIENT TILE FLOORING Section 09 68 00, CARPETING.

**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. Mosaic floor tile panels, 225 mm by 225 mm (9 inches by 9 inches), each type, color, size and pattern.
  - 5. Porcelain tile, each type, color, patterns and size.
  - 6. Wall (or wainscot) tile, each color, size and pattern.
  - 7. Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, color, and size.
- C. Product Data:
  - 1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
  - 2. Chemical resistant mortar and grout (Epoxy and Furan).
  - 3. Cementitious backer unit.
  - 4. Dry-set Portland cement mortar and grout.
  - 5. Divider strip.
  - 6. Elastomeric membrane and bond coat.
  - 7. Reinforcing tape.
  - 8. Leveling compound.

9. Latex-Portland cement mortar and grout.
  10. Commercial Portland cement grout.
  11. Organic adhesive.
  12. Slip resistant tile.
  13. Waterproofing isolation membrane.
  14. Fasteners.
- 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 (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.

#### **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):
  - A10.20-05.....Safety Requirements for Ceramic Tile, Terrazzo, and Marble Works
  - A108.1A-05.....Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar

- A108.1B-05.....Installation of Ceramic Tile on a Cured  
Portland Cement Mortar Setting Bed with dry-Set  
or latex-Portland Cement Mortar
- A108.1C-05.....Contractors Option; Installation of Ceramic  
Tile in the Wet-Set method with Portland Cement  
Mortar or Installation of Ceramic Tile on a  
Cured Portland Cement Mortar Setting Bed with  
Dry-Set or Latex-Portland Cement Mortar
- A108.4-05.....Installation of Ceramic Tile with Organic  
Adhesives or Water Cleanable Tile Setting Epoxy  
Adhesives
- A108.5-05.....Installation of Ceramic Tile with Dry-Set  
Portland Cement Mortar or Latex-Portland Cement  
Mortar
- A108.6-05.....Installation of Ceramic Tile with Chemical  
Resistant, Water Cleanable Tile-Setting and  
Grouting Epoxy
- A108.8-05.....Installation of Ceramic Tile with Chemical  
Resistant Furan Resin Mortar and Grout
- A108.10-05.....Installation of Grout in Tilework
- A108.11-05.....Interior Installation of Cementitious Backer  
Units
- A108.13-05.....Installation of Load Bearing, Bonded,  
Waterproof Membranes for Thin-Set Ceramic Tile  
and Dimension Stone
- A118.1-05.....Dry-Set Portland Cement Mortar
- A118.3-05.....Chemical Resistant, Water Cleanable Tile-  
Setting Epoxy and Water Cleanable Tile-Setting  
and Grouting Epoxy Adhesive
- A118.4-05.....Latex-Portland Cement Mortar
- A118.5-05.....Chemical Resistant Furan Mortars and Grouts for  
Tile Installation
- A118.6-05.....Standard Cement Grouts for Tile Installation
- A118.9-05.....Cementitious Backer Units
- A118.10-05.....Load Bearing, Bonded, Waterproof Membranes for  
Thin-Set Ceramic Tile and Dimension Stone  
Installation

- A136.1-05.....Organic Adhesives for Installation of Ceramic Tile
- A137.1-88.....Ceramic Tile
- C. American Society For Testing And Materials (ASTM):
- A185-07.....Steel Welded Wire Fabric, Plain, for Concrete Reinforcing
- C109/C109M-07.....Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch. or [50-mm] Cube Specimens)
- C241-90 (R2005).....Abrasion Resistance of Stone Subjected to Foot Traffic
- C348-02.....Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
- C627-93(R2007).....Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
- C954-07.....Steel Drill Screws for the Application of Gypsum Board on Metal Plaster Base to Steel Studs from 0.033 in (0.84 mm) to 0.112 in (2.84 mm) in thickness
- C979-05.....Pigments for Integrally Colored Concrete
- C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Panel Products
- C1027-99(R2004).....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
- C1127-01.....Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface
- C1178/C1178M-06.....Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
- D4397-02.....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. Marble Institute of America (MIA): Design Manual III-2007

E. 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 V, 12000 revolutions for floors in Corridors, Kitchens, Storage including Refrigerated Rooms
  - c. Class IV, 6000 revolutions for remaining areas.
3. Slip Resistant Tile for Floors:
  - a. Coefficient of friction, when tested in accordance with ASTM C1028, required for level of performance:
    - 1) Not less than 0.7 (wet condition) for bathing areas.
    - 2) Not less than 0.8 on ramps for wet and dry conditions.
    - 3) Not less than 0.6, except 0.8 on ramps as stated above, for wet and dry conditions for other areas.
  - b. Tile Having Abrasive Grains:
    1. Unglazed Ceramic Mosaic Tile: Abrasive grains throughout body of the tile.
    2. Quarry Tile: Abrasive grains uniformly embedded in face at rate of approximately 7.5 percent of surface area.
    - c. Porcelain Paver Tile: // Matte surface finish // with raised ridges spaced uniformly over tile surface. //
4. Mosaic tile may be mounted or joined together by a resinous bonding material along tile edges.
5. Do not use back mounted tiles in showers // therapeutic pools, // natatorium, // hydrotherapy, // whirlpool baths, // and congregate baths // unless certified by manufacturer as noted in paragraph 1.3.D.
6. 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.

7. 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 furan or epoxy
- B. Unglazed Ceramic Mosaic Tile: Nominal 6 mm (1/4 inch) thick with cushion edges.
- C. Unglazed Quarry Tile: Nominal 13 mm (1/2 inch) thick, square edges.
- D. Glazed Wall Tile: Cushion edges, glazing, as specified in (SEE ROOM FINISH SCHEDULE SHOWN ON DRAWINGS).
  
- F. Trim Shapes:
  1. Conform to applicable requirements of adjoining floor and wall tile.
  2. Use slip resistant trim shapes for horizontal surfaces of showers congregate baths, natatorium, hydrotherapy, therapeutic pool, overflow ledges, recessed steps, shower curbs, drying area curbs, and seats.
  3. Use trim shapes sizes conforming to size of adjoining field wall tile including existing spaces unless detailed or specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
  4. Internal and External Corners:
    - a. Square internal and external corner joints are not acceptable.
    - b. External corners including edges: Use bullnose shapes.
    - c. Internal corners: Use cove shapes.
    - d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.
    - e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.
    - f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.
    - g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.
    - h. For unglazed ceramic mosaic and glazed wall tile installed in Portland cement mortar setting bed, use cove and bullnose shapes

as applicable. When ceramic mosaic wall and base tile is required, use C Series cove and bullnose shapes.

- i. For unglazed ceramic mosaic and glazed wall tile installed in dry-set Portland cement mortar, latex-Portland cement mortar, and organic adhesive (thin set methods), use cove and surface bullnose shapes as applicable.
- j. For quarry tile work, use cove and bullnose shapes as applicable.
- k. Provide cove and bullnose shapes for countertops, stools, saddles, where shown, and required to complete tile work.

## 2.2 CEMENTITIOUS BACKER UNITS

- A. Use in showers or wet areas.
- B. ANSI A118.9.
- C. Use Cementitious backer units in maximum available lengths.
- D. Backer unit meet or exceed the following additional physical properties:

<u>Property</u>	<u>Test Method</u>	<u>Value</u>
Water absorption	ASTM C948	Less than 20 percent by weight

## 2.3 JOINT MATERIALS FOR CEMENTITIOUS BACKER UNITS

- A. Reinforcing Tape: Vinyl coated woven glass fiber mesh tape, open weave, 50 mm (2 inches) wide. Tape with pressure sensitive adhesive backing will not be permitted.
- B. Tape Embedding Material: Latex-Portland cement mortar complying with ANSI A118.4.
- C. Joint material, including reinforcing tape, and tape embedding material, shall be as specifically recommended by the backer unit manufacturer.

## 2.4 FASTENERS

- A. Screws for Cementitious Backer Units.
  - 1. Standard screws for gypsum board are not acceptable.
  - 2. Minimum 11 mm (7/16 inch) diameter head, corrosion resistant coated, with washers.
  - 3. ASTM C954 for steel 1 mm (0.033 inch) thick.
  - 4. ASTM C1002 for steel framing less than 0.0329 inch thick.
- B. Washers: Galvanized steel, 13 mm (1/2 inch) minimum diameter.

## 2.5 GLASS MAT WATER RESISTANT GYPSUM BACKER BOARD

Confirm to ASTM C1178/C1178M, Optional System for Cementitious Backer Units.

## 2.6 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 A118.4.
  - 1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A118.4.
  - 2. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of Portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
- D. Dry-Set Portland Cement Mortar: ANSI A118.1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A118.4.
- E. Organic Adhesives: ANSI A136.1, Type 1.
- F. Chemical-Resistant Bond Coat:
  - 1. Epoxy Resin Type: ANSI A118.3.
  - 2. Furan Resin Type: ANSI A118.5.
- G. Elastomeric Waterproofing Membrane and Bond Coat:
  - 1. TCA F122-02.
  - 2. ANSI A118.10.
  - 3. One component polyurethane, liquid applied material having the following additional physical properties:
    - a. Hardness: Shore "A" between 40-60.
    - b. Elongation: Between 300-600 percent.
    - c. Tensile strength: Between 40-60 psig.
    - d. No volatile compounds.
  - 4. Coal tar modified urethanes are not acceptable.
- H. 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.
4. Use is required in Commercial Portland Cement Grout, Dry-Set Grout, and Latex-Portland Cement Grout.

### B. White Portland Cement Grout:

1. ANSI A118.6.
2. Use one part white Portland cement to one part white sand passing a number 30 screen.
3. Color additive not permitted.

C. Commercial Portland Cement Grout: ANSI A118.6 color as specified.

D. Dry-Set Grout: ANSI A118.6 color as specified.

E. Latex-Portland Cement Grout: ANSI A118.6 color as specified.

1. Unsanded grout mixture for joints 3.2 mm (1/8 inch) and narrower.
2. Sanded grout mixture for joints 3.2 mm (1/8 inch) and wider.

### F. Chemical-Resistant Grout:

1. Epoxy grout, ANSI A118.3.

2. Furan grout, ANSI A118.5.

## **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.

## **2.9 MARBLE**

- A. Soundness Classification in accordance with MIA Design Manual III Groups.
- B. Thresholds:
  - 1. Group A, Minimum abrasive hardness (Ha) of 10.0 per ASTM C241.
  - 2. Honed finish on exposed faces.
  - 3. Thickness and contour as shown.
  - 4. Fabricate from one piece without holes, cracks, or open seams; full depth of wall or frame opening by full width of wall or frame opening; 19 mm (3/4-inch) minimum thickness and 6 mm (1/4-inch) minimum thickness at beveled edge.
  - 5. Set not more than 13 mm (1/2-inch) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2. On existing floor slabs provide 13 mm (1/2-inch) above ceramic tile surface with bevel edge joint top flush with adjacent floor.
  - 6. One piece full width of door opening. Notch thresholds to match profile of door jambs.
- C. Window Stools:
  - 1. Group A or B.

2. Polished finish on exposed faces.
3. Size and thickness as shown.

#### **2.10 METAL DIVIDER STRIPS**

- A. Terrazzo type divider strips.
- B. Heavy top type strip with 5 mm (3/16 inch) wide top and 38 mm (1-1/2 inch) long leg.
- C. Embedded leg perforated and deformed for keying to mortar.
- D. Aluminum or brass as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

#### **2.11 WATER**

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

- B. Patching and Leveling:
  - 1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.
  - 2. Fill holes and cracks and align concrete floors that are out of required plane with patching and leveling compound.
    - a. Thickness of compound as required to bring finish tile system to elevation shown.
    - b. Float finish // except finish smooth for elastomeric waterproofing. //
    - c. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
  - 3. Apply patching and leveling compound to concrete and masonry wall surfaces that are out of required plane.
  - 4. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.
- C. Mortar Bed for Slopes to Drains:
  - 1. Slope compound to drain where drains are shown.
  - 2. Install mortar bed in depressed slab sloped to drains not less than 1 in 200 (1/16 inch per foot).



3. Allow not less than 50 mm (2 inch) depression at edge of depressed slab.
  4. Screed for slope to drain and float finish.
  5. Cure mortar bed for not less than seven days. Do not use curing compounds or coatings.
- D. Additional preparation of concrete floors for tile set with epoxy, or furan-resin shall be in accordance with the manufacturer's printed instructions.
- E. Cleavage Membrane:
1. Install polythene sheet as cleavage membrane in depressed slab when waterproof membrane is not scheduled or indicated.
  2. Turn up at edge of depressed floor slab to top of floor.
- F. Walls:
1. In showers or other wet areas cover studs with polyethylene sheet.
  2. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.
  3. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.
  4. Apply metal lath to framing in accordance with ANSI A108.1:
    - a. Use fasteners specified in paragraph "Fasteners." Use washers when lath opening is larger than screw head.
    - b. Apply scratch and leveling coats to metal lath in accordance with ANSI A108.1.C.
    - c. Total thickness of scratch and leveling coats:
      - 1) Apply 9 mm to 16 mm (3/8 inch to 5/8 inch) thick over solid backing.
      - 2) 16 mm to 19 mm (5/8 to 3/4 inch) thick on metal lath over studs.
      - 3) Where wainscots are required to finish flush with wall surface above, adjust thickness required for flush finish.
    - d. Apply scratch and leveling coats more than 19 mm (3/4 inch) thick in two coats.
- G. Existing Floors and Walls:
1. Remove existing composition floor finishes and adhesive. Prepare surface by grinding, chipping, self-contained power blast cleaning or other suitable mechanical methods to completely expose

- uncontaminated concrete or masonry surfaces. Follow safety requirements of ANSI A10.20.
2. Remove existing concrete fill or topping to structural slab. Clean and level the substrate for new setting bed and waterproof membrane or cleavage membrane.
  3. Where new tile bases are required to finish flush with plaster above or where they are extensions of similar bases in conjunction with existing floor tiles cut channel in floor slab and expose rough wall construction sufficiently to accommodate new tile base and setting material.

#### **3.4 CEMENTITIOUS BACKER UNITS**

- A. Remove polyethylene wrapping from cementitious backer units and separate to allow for air circulation. Allow moisture content of backer units to dry down to a maximum of 35 percent before applying joint treatment and tile.
- B. Install in accordance with ANSI A108.11 except as specified otherwise.
- 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.

**3.6 MARBLE**

- A. Secure thresholds and stools in position with minimum of two stainless steel dowels.
- B. Set in dry-set Portland cement mortar or latex-Portland cement mortar bond coat.
- C. Set threshold to finish 12mm (1/2 inch) above ceramic tile floor unless shown otherwise, with bevel edge joint top flush with adjacent floor similar to TCA detail TR611-02.

**3.7 METAL DIVIDER STRIPS**

- A. Install metal divider strips in floor joints between ceramic and quarry tile floors and between tile floors and adjacent flooring of other materials where the finish floors are flush unless shown otherwise.
- B. Set divider strip in mortar bed to line and level centered under doors or in openings.
- //C. At preformed sealant joint: Refer to Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
  - 1. Comply with recommendations in TCA "Handbook for Ceramic Tile Installation" Vertical and Horizontal Joint Design Essentials. TCA System EJ 171-02.
    - a. Locate joint in tile surfaces directly above joint in sub-floor or where indicated when used with isolation membranes to allow off-setting of joint location from sub-floor joint.
    - b. Fasten full length to sub-floor using a construction adhesive.
    - c. Trowel setting material with full coverage over the entire leg.
  - 2. Set tile up against the joint ensuring that the top edge of the joint is flush or slightly below the top of the tile. //

**3.8 CERAMIC TILE - GENERAL**

- A. Comply with ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" applicable to methods of installation.
- B. Comply with TCA Installation Guidelines:
- C. Installing Mortar Beds for Floors:
  - 1. Install mortar bed to not damage cleavage or waterproof membrane; 32 mm (1-1/2 inch) minimum thickness.

2. Install floor mortar bed reinforcing centered in mortar fill.
3. Screed finish to level plane or slope to drains where shown, float finish.
4. For thin set systems cure mortar bed not less than seven days. Do not use curing compounds or coatings.
5. For tile set with Portland cement paste over plastic mortar bed coordinate to set tile before mortar bed sets.

D. Setting Beds or Bond Coats:

1. Where recessed or depressed floor slabs are filled with Portland cement mortar bed, set ceramic mosaic floor tile in either Portland cement paste over plastic mortar bed or latex-Portland cement mortar over cured mortar bed except as specified otherwise, ANSI A108-1C, TCA System F121-02 or F111-02.
2. Use quarry tile in chemical-resistant bond coat, except in floor of walk-in refrigerator rooms use: TCA system R 612-02.
  - a. Portland cement paste over plastic mortar bed. ANSI A108.1A.
  - b. Dry-set Portland cement mortar over cured mortar bed. ANSI A108.1B.
3. Pools Holding Water: ANSI A108. 1C. Do not use Latex Portland cement mortar.
4. Set floor tile in elastomeric bond coat over elastomeric membrane ANSI 108. 13, TCA System F122 where scheduled.
  - a.
  - b.
  - c.
5. Set wall tile installed over concrete or masonry in dry-set Portland cement mortar, or latex-Portland cement mortar, ANSI 108.1B.and TCA System W211-02, W221-02 or W222-02.
6. Set wall tile installed over concrete backer board in latex-Portland cement mortar, ANSI A108.1B.
7. Set wall tile installed over Portland cement mortar bed on metal lath base in Portland cement paste over plastic mortar bed, or dry-set Portland cement mortar or latex-Portland cement mortar over a cured mortar bed, ANSI A108.1C, TCA System W231-02, W241-02.
8. Set tile over concrete in therapeutic pools in Portland cement paste or dry set Portland cement mortar, ANSI A108.1C, TCA System S151-02

9. Set tile installed over gypsum board and gypsum plaster in organic adhesive, ANSI A108.4, TCA System W242-02.
10. Set trim shapes in same material specified for setting adjoining tile.

E. Workmanship:

1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field. Align new tile work scheduled for existing spaces to the existing tile work unless specified otherwise.
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.

### **3.9 CERAMIC TILE INSTALLED WITH PORTLAND CEMENT MORTAR**

- A. Mortar Mixes for Floor, Wall And Base Tile (including Showers, // and Therapeutic Pools //): ANSI A108.1.except specified otherwise.
- B. Installing Wall and Base Tile: ANSI A108.1, except specified otherwise.
- C. Installing Floor Tile: ANSI A108.1, except as specified otherwise.  
Slope mortar beds to floor drains a minimum of 1 in 100 (1/8 inch per foot).

### **3.10 PORCELAIN TILE INSTALLED WITH LATEX PORTLAND CEMENT BONDONG MORTAR**

Due to the denseness of porcelain tile use latex Portland cement bonding mortar that meets the requirements of ANSI A118.4. Bonding mortars shall be mixed in accordance with manufacturer's instructions. Improper liquid ratios and dwell time before placement of bonding mortar and tile shall affect bond.

**3.11 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH DRY-SET PORTLAND CEMENT AND LATEX-PORTLAND CEMENT MORTAR**

- A. Installation of Tile: ANSI A108.5, except as specified otherwise.
- B. Slope tile work to drains not less than 1 in 100 (1/8 inch per foot).

**3.12 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH ORGANIC ADHESIVE**

Installation of Tile: ANSI A108.4.

**3.13 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH CHEMICAL-RESISTANT BOND COAT**

- A. Epoxy Resin Type: Install tile in accordance with Installation of Tile with Epoxy Mortar; ANSI A108.6.
- B. Furan Resin Type: Proportion, mix and place in accordance with the manufacturer's printed instructions. Set tile in accordance with ANSI A108.8.

**3.14 CERAMIC AND PORCELAIN TILE INSTALLED WITH ELASTOMERIC BOND COAT**

- A. Surface Preparation: Prepare surfaces as specified in paragraph 3.3G
- B. Installation of Elastomeric Membrane: ANSI A108.13 and TCA F122-02.
  - 1. Prime surfaces, where required, in accordance with manufacturer's instructions.
  - 2. Install first coat of membrane material in accordance with manufacturer's instructions, in thickness of 0.75 to 1.3 mm (30 to 50 mils).
  - 3. Extend material over flashing rings of drains and turn up vertical surfaces not less than 100 mm (four inches) above finish floor surface.
  - 4. When material has set, recoat areas with a second coat of elastomeric membrane material for a total thickness of 1.3 to 1.9 mm (50 to 75 mils).
  - 5. After curing test for leaks with 25 mm (one inch) of water for 24 hours.
- C. Installation of Tile in Elastomeric Membrane:
  - 1. Spread no more material than can be covered with tile before material starts to set.
  - 2. Apply tile in second coat of elastomeric membrane material in accordance with the coating manufacturer's instructions in lieu at aggregate surfacing specified in ASTM C1127. Do not install top coat over tile.

**3.15 GROUTING**

- A. Grout Type and Location:

1. Grout for glazed wall and base tile, paver tile and unglazed mosaic tile Portland cement grout, latex-Portland cement grout, dry-set grout, or commercial Portland cement grout.
2. Grout for quarry tile floor and base:
  - a. Grout for floors of walk-in refrigerated rooms: Epoxy grout.
  - b. Therapeutic pool areas: Portland cement grout.
  - c. Grout for Kitchens:
    - 1) Chemical-resistant grout as specified and recommended by manufacturer of bond coat.
    - 2) Use only furan resin grout within 600 mm (2 feet) of ovens, steam kettles, water heaters, steam pipes.
    - 3) Epoxy grout designed for equivalent heat resistance to furan resin grout may be used for furan resin grout.
3. Grout for tile of therapeutic pools: Portland cement grout.

B. Workmanship:

1. Install and cure grout in accordance with the applicable standard.
2. Portland Cement grout: ANSI A108.10.
3. Epoxy Grout: ANSI A108.6.
4. Furan and Commercial Portland Cement Grout: ANSI A108.8 and in accordance with the manufacturer's printed instructions.
5. Dry-set grout: ANSI A108.5.

### 3.16 MOVEMENT JOINTS

- A. Prepare tile expansion, isolation, construction and contraction joints for installation of sealant. Refer to Section 07 92 00, JOINT SEALANTS.
- B. TCA details EJ 171-02.
- C. At expansion joints, rake out joint full depth of tile and setting bed and mortar bed. Do not cut waterproof or isolation membrane.
- D. Rake out grout at joints between tile, tub, service sink, at toe of base, and where shown not less than 6 mm (1/4 inch) deep.

### 3.17 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.

### **3.18 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.

### **3.19 TESTING FINISH FLOOR**

- A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.
- B. Test kitchen and storage rooms.

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**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:  
SEE ROOM FINISH SCHEDULE SHOWN ON DRAWINGS..

**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,
  - 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.

**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
C636-06.....	Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
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.
  - 2. Use same construction for cross runners as main runners. Use of lighter-duty sections for cross runners is not acceptable.
- B. Exposed grid suspension system for support of 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 on ROOM FINISH SCHEDULE SHOWN ON DRAWINGS.
- C. Concealed grid suspension system for support of mineral base acoustical tile:

1. Concealed grid upward access suspension system to provide an initial opening of 300 mm by 600 mm (12 by 24 inches) and for removal of adjacent runners and tile without the use of special tools, and without damage to suspension system and acoustical tile.
  2. Minimum flange width of 22 mm (7/8 inch) except for access hook and angle.
  3. Minimum flange width of 11 mm (7/16 inch) for access hook and angle.
- D. 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).

## **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.


**2.6 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/m<sup>2</sup> (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/m<sup>2</sup> (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 on ROOM FINISH SCHEDULE SHOWN ON DRAWINGS.

7. Lay-in panels: Sizes and edges as shown on drawings.

## 2.9 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 m<sup>2</sup> (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. Install hanger inserts and wire loops required for support of hanger

#### 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.

### **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.
- E. 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.

### **3.5 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**

This section specifies the installation of vinyl or rubber base and resilient stair treads with sheet rubber flooring on landings.

**1.2 RELATED WORK**

- A. Color and texture: SEE ROOM FINISH SCHEDULE SHOWN ON DRAWINGS..
- 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. Resilient Stair Treads: 150 mm (6 inches) long.
  - 3. Sheet Rubber Flooring: 300 mm (12 inches) square.
  - 4. Adhesive: Literature indicating each type.

**1.4 DELIVERY**

- A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
- B. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

**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
- C. Federal Specifications (Fed. Spec.):  
RR-T-650E.....Treads, Metallic and Non-Metallic, Nonskid

**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 (4 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.

**2.5 PRIMER (FOR CONCRETE FLOORS)**

As recommended by the adhesive and tile manufacturer.

**2.6 LEVELING COMPOUND (FOR CONCRETE FLOORS)**

Provide products with latex or polyvinyl acetate resins in the mix.

**2.7 ADHESIVES**

- A. Use products recommended by the material manufacturer for the conditions of use.
- B. Use low-VOC adhesive during installation. Water based adhesive with low VOC is preferred over solvent based adhesive.

**PART 3 - EXECUTION****3.1 PROJECT CONDITIONS**

- A. Maintain temperature of materials above 21° C (70 °F), for 48 hours before installation.
- B. Maintain temperature of rooms where work occurs, between 21° C and 27° C (70°F and 80°F) for at least 48 hours, before, during, and after installation.
- C. Do not install materials until building is permanently enclosed and wet construction is complete, dry, and cured.

### 3.2 INSTALLATION REQUIREMENTS

- A. The respective manufacturer's instructions for application and installation will be considered for use when approved by the 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 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.

### 3.7 CLEANING AND PROTECTION

- A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets.
- B. Keep traffic off resilient material for at least 72 hours after installation.
- C. Clean and polish materials in the following order:
- 1. After two weeks, scrub resilient base, 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.
- 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 required over metal base of casework: Section 12 31 00, MANUFACTURED METAL CASEWORK.
- D. Resilient base over base of lockers, equipment and casework: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- E. 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.

#### **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):
  - E648-09.....Critical Radiant Flux of Floor-Covering Systems  
Using a Radiant Energy Source.
  - E662-09.....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.....Sheet Vinyl Floor Covering with Backing.
  - F1869-04.....Moisture Vapor Emission Rate of Concrete  
Subfloor using Anhydrous Calcium Chloride
  - F1913-04.....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**

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:**

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**

Water resistant type recommended by the sheet flooring manufacturer for the conditions of use. VOC not to exceed 50g/L

#### **2.6 BASE CAP STRIP AND COVE STRIP**

- A. Extruded vinyl compatible with the sheet flooring.
- B. Cap strip "J" shape with feathered edge flange approximately 25 mm (one inch) wide; top designed to receive sheet flooring with 13 mm (1/2 inch) flange lapping top of flooring
- C. Cove strip 70 mm (2-3/4 inch) radius.

#### **2.7 LEVELING COMPOUND (FOR CONCRETE FLOORS)**

Provide cementitious products with latex or polyvinyl acetate resins in the mix.

#### **2.8 PRIMER (FOR CONCRETE SUBFLOORS)**

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. Coordinate with Asbestos Abatement Section if asbestos abatement procedures will be involved.
- I. Remove existing resilient flooring and adhesive completely in accordance with Resilient Floor Covering Institute recommendations in manual RFCI-WP. Solvents shall not be used.

### **3.3 INSTALLATION OF FLOORING**

- A. Install work in strict compliance with manufacturer's instructions and approved layout drawings.
- B. Maintain uniformity of sheet vinyl floor covering direction and avoid cross seams.
- C. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas, but in no case less than 150 mm (6 inches) away from parallel joints in flooring substrates.
- D. Match edges of resilient floor coverings for color shading and pattern at seams.

- E. Where resilient sheet flooring abuts other flooring material floors shall finish level.
- F. Extend sheet vinyl floor coverings into toe spaces, door reveals, closets, and similar openings.
- G. Inform the 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 expose edge with the cap strip.
  - 3. Form internal and external corners to the geometric shape generated by the cove at either straight or radius corners.
  - 4. Solvent weld joints as specified for the flooring. Seal cap strip to wall with an adhesive type sealant.
  - 5. Unless otherwise specified or shown where sheet flooring is scheduled, provide integral base at intersection of floor and vertical surfaces. Provide sheet flooring and base scheduled for room on floors and walls under and behind areas where casework, laboratory and pharmacy furniture and other equipment occurs, except where mounted in wall recesses.

**3.4 INSTALLATION OF INTEGRAL COVED BASE**

- A. Set preformed cove to receive base. Install base material with adhesive and terminate exposed edge with cap strip. Integral base shall be // 100 mm (4 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**

This section specifies the installation of solid vinyl tile flooring, vinyl composition tile flooring, rubber 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.

**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
  - F1066-04 (R2010).....Vinyl Composition Floor Tile
  - F1344-10.....Rubber Floor Tile
  - F1700-04 (R2010).....Solid Vinyl Floor Tile
- C. Resilient Floor Covering Institute (RFCI):
  - IP #2.....Installation Practice for Vinyl Composition  
Tile (VCT)
- D. Federal Specifications (Fed. Spec.):
  - SS-T-312.....Tile Floor: Asphalt, Rubber, Vinyl and Vinyl  
Composition

**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.



**2.2 VINYL COMPOSITION TILE**

- A. ASTM F1066, Composition 1, Class I (solid color) Class 2 (through pattern), 300 mm (12 inches) square, 3 mm (1/8 inch) thick.
- B. Color and pattern uniformly distributed throughout thickness.

**2.3 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.

**2.5 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.

**2.6 PRIMER (FOR CONCRETE SUBFLOORS)**

As recommended by the adhesive and tile manufacturer.

**2.7 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.

**2.8 POLISH AND CLEANERS**

- A. Cleaners RFCI CL-1.
- B. Polish: ASTM D4078.

**2.9 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.

**2.10 SCREWS**

Stainless steel flat head screw.

**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:
  - 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:
  - 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.

### 3.6 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 23.50**  
**RESINOUS (EPOXY TERRAZZO) FLOORING (RES-5)**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies epoxy terrazzo flooring systems with integral cove base.
- B. Resinous (Epoxy Terrazzo) Flooring Systems:
  - 1. Thinset Epoxy or Urethane Matrix Terrazzo.
  - 2. Thinset Polyacrylate Matrix Terrazzo.

**1.2 RELATED WORK**

- A. Concrete and Moisture Vapor Barrier: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Sealants installed with Terrazzo: Section 07 92 00, JOINT SEALANTS.
- C. Color and location of each type of resinous (epoxy terrazzo) flooring: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Floor Drains: Division 22, PLUMBING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Description of each product to be provided.
  - 2. Application and installation instructions.
  - 3. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.
- C. Qualification Data: For Installer.
- D. Sustainable Submittal:
  - 1. Product data for products having recycled content, submit documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
    - a. Include statements indicating costs for each product having recycled content.
  - 2. Product data for field applied adhesives, 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.
  4. Accessories: (6 inches) 152 mm long sample of exposed strip item.
- F. Shop Drawings: Include plans, sections, component details, and attachment to other trades. Indicate layout of the following:
1. Patterns.
  2. Edge configuration.
  3. Divider strips.
  4. Control-joint strips.
  5. Accessory strips.
  6. Abrasive strips.
- G. Certifications and Approvals:
1. Manufacturer's certification of material and substrata 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 in use for a minimum of five 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 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 10 projects of similar size and complexity. Include list of at least 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 marble chips aggregate, strips, patching and fill material, joint sealant, and repair material of type and from source recommended by manufacturer of primary materials.
  3. Obtain marble chips, aggregate color, grade, type, and variety of granular materials from one source with resources to provide materials of consistent quality in appearance and physical properties.
  4. Material furnished shall meet NTMA Specifications.
- D. NTMA Standards: Comply with NTMA's "Terrazzo Specification and Design Guide" and written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- E. 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. Include 48 inch (1200 mm) length of integral cove base.
  2. Approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.
  3. Sign off from VA Resident Engineer on texture must be complete before installation of flooring system.
- F. 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 contaminants
- 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 and pattern and edge conditions.
  - f. Performance of the coating with chemicals anticipated in the area receiving the resinous (epoxy terrazzo) 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
- G. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.
- H. 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 terrazzo 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.



**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 (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 (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(2010)....Four Epoxy Specifications (Reapproved 2003).
- C. American Society for Testing and Materials (ASTM):  
B221-13.....Standard Specification for Aluminum and  
Aluminum Alloy

C92-95(2010)	Standard Test Methods for Sieve Analysis and Water Content
C109-12	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2" or 50 mm Cube Specimens)
C190-85	Method of Test for Tensile Strength of Hydraulic Cement Mortars (Withdrawn 1990)
C307-03(2012)	Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing
C413-01(2012)	Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes
C531-00(2012)	Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
C579-01(2012)	Standard Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
C580-02(2012)	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
C722-04(2012)	Standard Specification for Chemical-Resistant Monolithic Floor Surfacing
C811-98(2008)	Standard Practice for Surface Preparation of Concrete for Application of Chemical-Resistant Resin Monolithic Surfacing
D56-05(2010)	Standard Test Method for Flash Point by Tag Closed Cup Tester
D635-10	Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
D638-10	Standard Test Method for Tensile Properties of Plastics
D695-10	Standard Test Method for Compressive Properties of Rigid Plastics

- D696-08.....Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer
- D790-10.....Standard Test Methods for Flexural Properties
- D2240-05(2010).....Standard Test Method for Rubber Property – Durometer Hardness
- D3108-13.....Standard Test Method for Coefficient of Friction
- D3960-05.....Standard Practice for Determining Volatile Organic Compound
- D4060-10.....Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
- D4541-09.....Standard Test Method for Pull off Strength Coatings
- E162-13.....Standard Test Method for Surface Flammability of Using a Radiant Heat Energy Source
- E648-10.....Standard Test Method for Critical Radiant Flux of Floor- Covering Systems Using a Radiant Heat Energy Source
- F1679-04.....Standard Test Method for Using Variable Incidence Tribometer
- F1869-11.....Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- F2170-11.....Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
- G21-09.....Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- D. Military Specification (Mil Spec): Deck Covering Underlay Materials
- MIL-PRF-3135.....Para. 3.6, Resistance to Elevated Temperature  
 Para. 3.15, Impact Resistance  
 Para. 4.7.3, Indentation Resistance  
 Para. 4.7.3, Indentation, No Cracking or Loss of Bond Water Absorption  
 Para. 4.7.4.2.1, Indentation under Steadily Applied Load

Para. 4.7.5.1, Resistance to Elevated  
Temperatures

Para. 4.7.8, Water Absorption

Para. 4.7.14, Adhesion

MIL-D-3134F.....Deck Covering Material

MIL-STD-810E.....Environmental Requirements and Related Test  
Methods

E. National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 501.....Finishes for Aluminum

F. National Terrazzo and Mosaic Association, Inc. (NTMA).  
"Terrazzo Specifications and Design Guide"  
"Terrazzo Color Palette"

G. Terrazzo, Tile and Marble Association of Canada. (TTMAC).

H. Underwriters Laboratories (UL):  
UL 410.....Slip Resistance of Floor Surface Materials

## **PART 2 - PRODUCTS**

### **2.1 SYSTEM DESCRIPTION FOR RESINOUS (EPOXY TERRAZZO) FLOORING**

A. System Descriptions:

1. Monolithic, multi-layer, trowel applied multi-component epoxy  
urethane terrazzo and integral cove base. UV stable and breathable  
where required.

B. Systems shall meet or exceed all applicable NTMA and TTMAC standards.

C. System Components: Verify specific requirements as systems vary by  
manufacturer. Verify compatibility with substrate. Use manufacturer's  
standard components, compatible with each other and as follows:

1. Bond Coat (Primer): Verify inclusion of primer in manufacturer's  
system.

a. Resin: Epoxy.

b. Formulation Description: 100 percent solids.

c. Binder: Formulated to meet physical properties of MIL-D-3134F.

d. Application Method: Apply by spray, brush, or roller.

1) Thickness of coats: Verify thickness as systems vary by  
manufacturer; approximate range from 5 to 6 mils  
(0.13 to 0.15 mm) to 150 to 250 square feet per gallon  
(52.76 to 87.93 square meters per liter).

2. Body Coat:

- a. Resin: Epoxy or Urethane.
  - b. Formulation Description: 100 percent solids.
  - c. Binder: Formulated to meet physical properties of MIL-D-3134F.
  - d. Application Method: Varies by manufacturer; hand or power troweled.
    - 1) Trowel application:
      - a) Thickness of coat: Verify thickness as systems vary by manufacturer; approximate range from 3/16 inch or 1/4 inch or 3/8 inch (4.76 to either 6.35 mm or 9.5 mm).
      - b) Number of coats: One.
  - e. Aggregates: Verify amount per thickness as systems vary by manufacturer:
    - 1) Marble (#1 size maximum), glass, or granite chips or other approved materials. Colored rubberized aggregates
3. Grout Coat:
- a. Resin: Epoxy.
  - b. Formulation Description: 100 percent solids.
  - c. Application Method: Varies by manufacturer. Apply by red rubber squeegee or spring-steel trowel.
    - 1) Apply to rough ground mortar coat to completely fill all voids.
    - 2) Thickness of coat: Verify thickness as systems vary by manufacturer; approximate range from a minimum of 8 to 10 mils (0.2 to 0.25 mm) to a maximum of 400 to 500 square feet per gallon (140.65 to 175.81 square meters per liter).
4. Seal Coat/Top Coat:
- a. Resin: Single- or multi-component Urethane.
  - b. Formulation Description: 100% solids. It shall have a pH factor between 7 and 10 and shall be a penetrating type specially prepared for use on terrazzo. It shall not discolor or amber the terrazzo and shall produce a slip resistant surface. Flash point of sealer shall be a minimum of 80 degrees F (26 degrees C) when tested in accordance with ASTM D 56.
  - c. Application Method: Varies by manufacturer. Apply using notched squeegee and backroll or using a lambs wool applicator.
    - 1) Apply to fine ground mortar coat to completely fill all voids.
    - 2) Thickness of coat: Verify thickness as systems vary by manufacturer; approximate range from a minimum of 4 to 5 mils

(0.1 to 0.13 mm) to a maximum of 500 to 750 square feet per gallon (175.81 to 263.74 square meters per liter).

3) Number of coats: One.

d. Aggregates: Verify inclusion of slip-retardant aggregates in seal coat/top coat.

e. Textured Top Coat: Slip Resistant in accordance with UL 410.

D. System Characteristics:

1. Color and Pattern: As selected by VA Resident Engineer from manufacturer's standard colors As indicated in Section 09 06 00, SCHEDULE OF FINISHES.
2. Integral cove base: 1 inch (25.4 mm) radius epoxy mortar cove keyed into concrete substrate. Verify cove base installation with manufacturer's system.
3. Overall System Thickness: Verify thickness as systems vary by manufacturer; approximate range from a minimum of 3/16 inch (4.76 mm) to a maximum of either 1/4 inch or 3/8 inch (6.35 mm or 9.5 mm).
4. Finish: Standard anti-slip resistant to meet or exceed 0.06 dry; 0.08 wet.

E. Physical Properties:

1. Conform to ASTM C722, Type A, Epoxy resin, quartz aggregate.
2. Other physical properties of seamless troweled (quartz epoxy) resinous flooring system in addition to C722 when tested to be as follows:

Test	Property	Value
ACI 503 R	Adhesion	350 psi /100% concrete failure
ASTM C-109	Compressive Strength	4000 PSI
ASTM C-190	Tensile Strength	800 PSI
ASTM C-307	Tensile Strength	800 PSI
ASTM C-413	Water Absorption	< 0.5%
ASTM C-531	Thermal Coefficient of Linear Expansion	$4.7 \times 10^{-8}$
ASTM C-579	Compressive Strength	6000 PSI
ASTM C-580	Flexural	2000 to 4500 psi
ASTM C-92	Flash Point	140 degrees F
ASTM D-635	Flame Spread	< 0.25 inches (6.35 mm)/self extinguishing

Test	Property	Value
ASTM D-638	Tensile Strength	3000 psi
ASTM D-695	Compressive Strength	12,000 psi
ASTM D-696	Thermal Co-efficient of Linear Expansion	14x10 <sup>-6</sup> inch /inch /degrees F
ASTM D-790	Flexural Modulus	500000 psi
ASTM D-2240 Shore D	Surface Hardness	80-90
ASTM D3108	Chemical Resistance	Refer to manufacturer's Chemical Resistance Charts for appropriate topping materials for required degrees of UV stability, resistance to environmental conditions, anticipated chemical reagents, or other applicable requirements
ASTM D-3960	Volatile Organic Compounds (VOC)	Primer Coat: 0 Base Coat: 0 Top Coat: 0
ASTM D-4060, CS-17	Abrasive Resistance	0<0.1 gm max weight loss
ASTM D-4541	Tensile Bond Strength	Cohesive Failure of Concrete
ASTM E-162	Flammability	<1
ASTM E-648	Critical Radiant Flux	<1
ASTM F-1679	Co-efficient of Friction	Dry - 0.81 Wet - 0.56
ASTM G-21	Microbial Resistant	Passes
MIL STD 810E	Fungus Resistance	No Growth
Mil PRF-3135	Indentation Characteristics	<5% / no cracking and loosening
-	Skid Resistance	Must pass
-	Density	125 lb/cu. ft.

## 2.2 SUPPLEMENTAL MATERIALS

- A. Waterproofing Membrane: Type recommended or produced by manufacturer of resinous (epoxy terrazzo) flooring for type of service and conditions as indicated in Drawings and/or specified .

- B. Crack Isolation Membrane: Type recommended or produced by manufacturer of resinous floor coating.
- C. Anti-Microbial Additive: Incorporate anti-microbial chemical additive to prevent growth of most bacteria, algae, fungi, mold, mildew, yeast, etc.
- D. Strips:
  - 1. Dividing strips "L" shaped as manufactured for use with resinous (Epoxy Terrazzo) flooring system.
    - a. White alloy zinc, 18 (1.214mm) gauge.
    - b. Plastic dividing strips shall not be used.
  - 2. Control Joint double "L" shaped strips as manufactured for use with resinous (Epoxy Terrazzo) flooring system. Position strips back to back.
    - a. White alloy zinc, 16 (1.518mm) gauge.
    - c. Plastic strips shall not be used.
- E. Patching and Fill Material: Resinous product of or approved by resinous (Terrazzo) flooring manufacturer for application indicated.
- F. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service or joint conditioned indicated.

### **2.3 BASE CAP STRIP**

- A. Aluminum, Extruded: ASTM B221, Alloy 6063-T6.
- B. Shape for 3/16 inch (4.76 mm) depth of base material, "J" configuration.
- C. Finish:
  - 1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
  - 2. Aluminum: NAAMM AMP 501:
    - a. Clear anodic coating, AA-C22A41 chemically etched medium matte, with Architectural Class 1, 0.018 mm (0.7 mils) or thicker.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION**

- A. Examine the areas and conditions where resinous (epoxy terrazzo) flooring 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.



1. MVT threshold for resinous (terrazzo) flooring shall not exceed 3 lbs/1000 square feet in a 24 hour period.
2. 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.
3. Perform additional substrata preparation as recommended by resinous flooring manufacturer's technical representative to obtain satisfactory results of moisture vapor transmission testing prior to commencement of the work.
4. Provide a written report showing test placement and results.

### **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) thereafter.
- 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 resinous (terrazzo) flooring system with integral cove base.
- B. Substrata 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. Mechanically prepare 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 in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 75 percent.
  - b. Perform maximum moisture-vapor-emission test, ASTM F 1869. Proceed with application only after substrates has obtained satisfactory results. If needed perform additional moisture tests until substrates pass testing.
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 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. Grind, cut or sand protrusions to receive base application.

### 3.5 APPLICATION

- A. General: Apply each component of resinous (epoxy terrazzo) flooring system with integral base according to manufacturer's directions to produce a uniform monolithic flooring surface of thickness indicated.
  - 1. Verify that the substrate (dryness, pH level, etc.) is acceptable by the manufacturer's technical representative.
  - 2. Use manufacturer recommended cleaning products.
- B. Prepare substrata for resinous (terrazzo) flooring system:
  - 1. Apply waterproof membrane as recommended by resinous flooring manufacturer at all vertical junctures and the entire flooring substrata. Embed fabric reinforcement into waterproof membrane liquid. Overlap all seams a minimum of 2 inches (51 mm).
  - 2. Apply crack isolation membrane as recommended by resinous flooring manufacturer.
  - 3. Apply substrata smoothing/patching underlayment as recommended by resinous flooring manufacturer.
- C. Resinous (epoxy terrazzo) flooring system: Per manufacturer's written instructions. Based on the porosity of the substrata additional coats may be required:
  - 1. Primer (Bond) Coat.
  - 2. Strips: Set divider and control strips as indicated on plans. Strips shall be set in a full bed of epoxy adhesive and allowed to cure before proceeding with the work.
  - 3. Body Coat: Apply body coat (including aggregate) evenly over the primer (bond) coat to the desired thickness.
  - 4. Power grind to expose aggregate.
  - 5. Grout Coat.
  - 6. Progressively fine grind and polish floor. Cleanse terrazzo with potable water and rinse. Remove excess rinse water and apply grout using identical Portland cement, color pigments as used in topping, ensuring to fill all voids. Cure Grout as recommended by manufacturer.
    - a. Grout may be left on terrazzo until all heavy and messy work in project is completed.
    - b. Fine grind until all grout is removed from surface.
    - c. Upon completion, terrazzo flooring shall display a minimum of 70% of marble chips.

7. Cleaning: Wash all surfaces with a neutral cleaner. Rinse with clean water and allow surface to dry
8. Seal Coat (Top Coat). Apply sealing coats of type recommended by manufacturer to produce finish matching approved samples.
9. Cove base: Apply cove base mix to wall surfaces at locations shown to form cove base to form 4-inch (101 mm) cove base height. Follow manufacturer's instructions and details including taping, mixing, priming, troweling, grinding, polishing, and top-coating of cove base.
  - a. When wall surface is not concrete, concrete masonry unit, install cement board and/or exterior grade plywood at locations shown to form cove base.

### **3.6 TOLERANCE**

- A. From line of plane: Maximum 1/8 inch (3.18 mm) in total distance of flooring and base.
- 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 (epoxy terrazzo) flooring in compliance with manufacturer's directions (during the application process), 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 (epoxy terrazzo) flooring materials from damage and wear during construction operation.
  1. Cover flooring with wax paper or Kraft paper.
  2. Cover paper with 1/4 inch (6.35 mm) 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 (Epoxy Terrazzo) flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous (Epoxy Terrazzo) flooring manufacturer.

- - - E N D - - -

**SECTION 09 68 00  
CARPETING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data:
  - 1. Manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading and flame resistance characteristics for each type of carpet material and installation accessory.
  - 2. Manufacturer's printed installation instructions for the carpet, including preparation of installation substrate, seaming techniques and recommended adhesives and tapes.
  - 3. Manufacturer's certificate verifying carpet containing recycled materials include percentage of recycled materials as specified.
- C. Samples:
  - 1. Carpet: "Production Quality" samples 300 x 300 mm (12 x 12 inches) of carpets, showing quality, pattern and color specified in Section 09 06 00, SCHEDULE FOR FINISHES.
  - 2. Floor Edge Strip (Molding): 150 mm (6 inches) long of each color and type specified.
  - 3. Base Edge Strip (Molding): 150 mm (6 inches) long of each color specified.

- D. Shop Drawings: Installers layout plan showing seams and cuts for sheet carpet and carpet module.
- E. Maintenance Data: Carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods and cleaning cycles.

#### **1.5 DELIVERY AND STORAGE**

- A. Deliver carpet in manufacturer's original wrappings and packages clearly labeled with manufacturer's name, brand, name, size, dye lot number and related information.
- B. Deliver adhesives in containers clearly labeled with manufacturer's name, brand name, number, installation instructions, safety instructions and flash points.
- C. Store in a clean, dry, well ventilated area, protected from damage and soiling. Maintain storage space at a temperature above 16 degrees C (60 degrees F) for 2 days prior to installation.

#### **1.6 ENVIRONMENTAL REQUIREMENTS**

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**

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. Broadloom; maximum width to minimum use
    - b. 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 SEAMING TAPE**

- A. Permanently resistant to carpet cleaning solutions, steam, and water.
- B. Recommended by carpet manufacturer.

**2.4 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.
- C. Carpet Base Top Edge Strip:
  - 1. Vinyl "J" strip wall flange minimum of 38 mm (1-1/2 inches) wide with cap beveled from wall to finish flush with carpet being installed.
  - 2. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

**2.5 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.
- 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. Bind or seal cut edge of sheet carpet and replace flanges or plates.
  - 2. Use additional adhesive to secure carpets around pipes and other vertical projections.
- G. Broadloom Carpet:
  - 1. Install per CRI 104, Section 8.
  - 2. Lay broadloom carpet lengthwise in longest dimension of space, with minimum seams, uniformly spaced to provide a tight smooth finish, free from movement when subjected to traffic.
  - 3. Use tape-seaming method to join sheet carpet edges. Do not leave visible seams.

H. 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.

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**SECTION 09 72 16**  
**VINYL-COATED FABRIC WALL COVERINGS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

Section specifies vinyl coated fabric wallcovering and installation.

**1.2 RELATED WORK**

- A. Color, pattern, type, direction of hanging and areas to receive wallcovering: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Textile wallcoverings: Section 09 72 31, POLYPROPYLENE FABRIC WALLCOVERING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
  - 1. Each type and pattern as specified in Section 09 06 00, SCHEDULE FOR FINISHES.
  - 2. Size: Full width of mill run.
- C. Manufacturer's Certificates:
  - 1. Compliance with CFFA W-101D.
  - 2. Wallcovering manufacturer's approval of adhesive.
- D. Manufacturer's Literature and Data:
  - 1. Primer and adhesive.
  - 2. Installation instructions.
  - 3. Maintenance instructions, including recommended materials and methods for maintaining wallcovering with precautions in use of cleaning material.

**1.4 QUALITY ASSURANCE**

- A. Finish one complete space with each type (color and pattern) of wallcovering showing specified colors and patterns.
- B. Use approved sample spaces as a standard for work throughout the project.

**1.5 DELIVERY, STORAGE AND HANDLING**

- A. Deliver in original unopened containers bearing the manufacturer's name, brand name, and product designation.
- B. Store in accordance with manufacturer's instructions.
- C. Handle to prevent damage to material.

**1.6 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. Chemical Fabrics and Film Association, Inc., (CFFA):  
2575-96(R2011).....Vinyl Coated Fabric Wallcovering
- C. American Society for Testing and Materials (ASTM)  
G21-09.....Determining Resistance of Synthetic Polymeric  
Materials to Fungi

**PART 2 - PRODUCTS****2.1 VINYL COATED FABRIC WALLCOVERING**

- A. Comply with CFFA-2575.
- B. Fungi Resistance: ASTM G21, rating of 0.
- C. Factory-applied clear delustered polyvinyl-fluoride (PVF) coating:
  - 1. Minimum 0.0125 mm (1/2 mil) thickness.
  - 2. Do not include PVF coating weight in minimum total weight.
  - 3. Fire hazard classification with PVF coating: Class A unless specified otherwise.

**2.2 ADHESIVE**

- A. Use only water-based adhesive having volatile organic compounds not more than 50 g/l.
- B. Vermin and mildew resistant.

**2.3 EDGE GUARDS OR TRIM**

- A. "J" shape with groove to receive the wallcovering.
- B. Concealed edge feathered, not less than 19 mm (3/4 inch) wide.
- C. Designed for adhesive attachment.

**PART 3 - EXECUTION****3.1 JOB CONDITIONS**

- A. Temperatures:
  - 1. Do not perform work until surfaces and materials have been maintained at minimum of 60 °F. for three days before work begins.
  - 2. Maintain minimum temperatures of 60 °F. until adhesives are dried or cured.
- B. Lighting:
  - 1. Do not proceed unless a minimum lighting level of 15 candlepower per square foot occurs.
  - 2. Measure light level at mid-height of wall.

- C. Ventilation:
  - 1. Provide uniform continuous ventilation in space.
  - 2. Ventilate for a time for not less than complete drying or curing of adhesive.
- D. Protect other surfaces from damage which may be caused by this work.
- E. Remove waste from building daily.

### **3.2 SURFACE CONDITION**

- A. Inspect surfaces to receive wallcoverings to assure that:
  - 1. Patches and repairs are completed.
  - 2. Surface are clean, smooth and prime painted.
- B. Do not proceed until discovered defects have been corrected by other trades and surfaces are ready to receive wallcovering.
- C. Carefully remove electrical outlet and switch plates, mechanical diffusers, escutcheons, registers, surface hardware, fittings and fastenings, prior to starting work.
- D. Carefully store items for reinstallation.

### **3.3 APPLICATION OF ADHESIVE**

- A. Mix and apply adhesives in accordance with manufacturer's directions.
- B. Prevent adhesive from getting on face of wallcovering.
- C. Apply adhesive to wallcovering back.

### **3.4 WALLCOVERING INSTALLATION**

- A. Use wallcovering of same batch or run in an area. Use fabric rolls in consecutive numerical sequence of manufacture.
- B. Install material completely adhered, smooth, clean, without wrinkles, air pockets, gaps or overlaps.
- C. Extend wallcovering continuous behind non-built-in casework and other items which are close to but not bolted to or touching the walls.
- D. Install wallcovering before installation of resilient base. Extend wallcovering not more than 6 mm (1/4 inch) below top of resilient base.
- E. Install panels consecutively in order in which they are cut from the roll including filling spaces above or below windows, doors, or similar penetrations.
- F. Do not install horizontal seams.
- G. Except on match patterns, hang fabric by reversing alternate strips, except as recommended by the manufacturer.
- H. Cutting:
  - 1. Cut on a work table with a straight edge.
  - 2. Joints or seams that are not cut clean are unacceptable.

3. Trim additional selvage to achieve a color and pattern match at seams. Overlapped seams are not allowed.
4. Do not double cut seams on wall unless specified.
5. If double cutting on the wall is necessary, place a three inch strip of Type I wallcovering under pasted edge.
  - a. Do not cut into wall surface.
  - b. After cutting, remove strip and excess adhesive from seam before proceeding to next seam.
  - c. Smooth down seam in adhesive for tight bond and joint.
- I. Trim strip-matched patterns, which are not factory pre-trimmed.
- J. Inside Corners:
  1. Wrap wallcovering around corner.
  2. Do not seam within 50 mm (2 inches) of inside corners.
  3. Double cut seam.
- K. Outside Corners:
  1. Wrap wallcovering around corner.
  2. Do not seam within 150 mm (6 inches) of outside corners.
  3. Double cut seam.

### **3.5 PATCHING**

- A. Replace surface damaged wallcovering in a space as specified for new work:
  1. Replace full height of surface.
  2. Replace from break in plane to break in plane when same batch or run is not used. Double cut seams.
  3. Adjoining differential colors from separate batches or runs are not acceptable.
- B. Correct loose or raised seams with adhesives to lay flat with tight bonded joint as specified for new work.

### **3.5 CLEANING AND INSTALLING TEMPORARY REMOVED ITEMS**

- A. Remove adhesive from wallcovering as work proceeds.
- B. Remove adhesives where spilled, splashed or splattered on wallcoverings or adjacent surfaces in a manner not to damage surface from which it is removed.
- C. Reinstall previously removed electrical outlet and switch plates, mechanical diffusers, escutcheons, registers, surface hardware, fittings and fastenings.

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**SECTION 09 91 00**  
**PAINTING**

**PART 1-GENERAL**

**1.1 DESCRIPTION**

- A. Section specifies field painting.
- B. Section specifies prime coats which may be applied in shop under other sections.
- C. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.

**1.2 RELATED WORK**

- A. 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, WOOD DOORS.
- C. Type of Finish, Color, and Gloss Level of Finish Coat: SEE ROOM FINISH SCHEDULE SHOWN ON DRAWINGS..

**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.
4. Intumescent clear coating or fire retardant paint.
5. Plastic floor coating.

**1.4 DELIVERY AND STORAGE**

## A. Deliver materials to site in manufacturer's sealed container marked to show following:

1. Name of manufacturer.
2. Product type.
3. Batch number.
4. Instructions for use.
5. Safety precautions.

## B. In addition to manufacturer's label, provide a label legibly printed as following:

1. Federal Specification Number, where applicable, and name of material.
  2. Surface upon which material is to be applied.
  3. 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 m<sup>2</sup> (100 ft<sup>2</sup>), 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**

- B. 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.
- R. Interior Satin Latex: MPI 43.
- S. Interior Low Sheen Latex: MPI 44.
- T. Interior Primer Sealer: MPI 45.
- U. Interior Enamel Undercoat: MPI 47.
- V. Interior Alkyd, Semi-Gloss (AK): MPI 47.
- W. Interior Alkyd, Gloss (AK): MPI 49.
- x. Interior Latex Primer Sealer: MPI 50.
- Y. Interior Alkyd, Eggshell: MPI 51
- Z. Interior Latex, MPI Gloss Level 3 (LE): MPI 52.

- AA. Interior Latex, Flat, MPI Gloss Level 1 (LE): MPI 53.
- BB. Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE): MPI 54.
- KK. Interior Wood Stain, Semi-Transparent (WS): MPI 90.
- LL. Wood Filler Paste: MPI 91.
- OO.High Build Epoxy Coating: MPI 98.RR. Interior latex, Gloss (LE) and (LG): MPI 114.
- .
- VV. Interior High Performance Latex, MPI Gloss Level 2(LF): MPI 138.
- WW. Interior High Performance Latex, MPI Gloss Level 3 (LL): MPI 139.
- XX. Interior High Performance Latex, MPI Gloss Level 4: MPI 140.
- YY. 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): VOC content of paint materials shall not exceed 10g/l for interior latex paints/primers and 50g/l for exterior latex paints and primers.
  2. Lead-Base Paint:
    - a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
    - b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
    - c. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
  3. Asbestos: Materials shall not contain asbestos.

4. Chromate, Cadmium, Mercury, and Silica: Materials shall not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
5. Human Carcinogens: Materials shall not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.
6. Use high performance acrylic paints in place of alkyd paints, where possible.
7. VOC content for solvent-based paints shall not exceed 250g/l and shall not be formulated with more than one percent aromatic hydro carbons by weight.

### **PART 3 - EXECUTION**

#### **3.1 JOB CONDITIONS**

- A. Safety: Observe required safety regulations and manufacturer's warning and 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.

#### **3.2 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.

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.
- I. 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.

- b. Interior wood except for transparent finish: MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat), thinned if recommended by manufacturer.
2. Apply two coats of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) to surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reason.
  3. Apply one coat of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) as soon as delivered to site to surfaces of unfinished woodwork, except concealed surfaces of shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish.
  4. Back prime and seal ends of exterior woodwork, and edges of exterior plywood specified to be finished.
  5. Apply MPI 67 (Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR) to wood for fire retardant finish.
- G. Gypsum Board
1. Surfaces scheduled to have (SEE ROOM FINISH SCHEDULE SHOWN ON DRAWINGS).MPI 53 (Interior Latex, Flat)
  2. Primer: MPI 50(Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) in shower and bathrooms.

### 3.7 INTERIOR FINISHES

- A. Apply following finish coats over prime coats in spaces or on surfaces specified in (SEE ROOM FINISH SCHEDULE SHOWN ON DRAWINGS)..
- 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)).

F. 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.
  - d. Two coats of MPI 51 (Interior Alkyd, Eggshell) (AK)).
4. Transparent Finishes on Wood Except Floors.
  - a. Natural Finish:
    - 1) One coat of sealer as written in 2.1 E.
    - 2) Two coats of MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV))//MPI 31 (Polyurethane, Moisture Cured, Clear

### 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.
- H. Coat knots and pitch streaks showing through old finish with MPI 36 (Knot Sealer) before refinishing.
- I. Sand or dull glossy surfaces prior to painting.
- J. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

### **3.9 PAINT COLOR**

- A. Color and gloss of finish coats is specified in SEE ROOM FINISH SCHEDULE SHOWN ON DRAWINGS..
- B. For additional requirements regarding color see Articles, REFINISHING EXISTING PAINTED SURFACE and MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE.
- C. Coat Colors:
  - 1. Color of priming coat: Lighter than body coat.
  - 2. Color of body coat: Lighter than finish coat.
  - 3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.
- D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:
  - 1. Paint to match color of casework where casework has a paint finish.
  - 2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

### **3.10 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 ROOM FINISH SCHEDULE SHOWN ON DRAWINGS, match surrounding surfaces.
  2. Paint colors as specified in ROOM FINISH SCHEDULE SHOWN ON DRAWINGS.except for following:
    - a. White .....Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.
    - b. Gray: .....Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
    - c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).
    - d. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conducts containing fire alarm control wiring, and fire alarm equipment.
    - e. Federal Safety Orange: .Entire lengths of electrical conduits containing feeders 600 volts or more.
- I. Apply paint systems on properly prepared and primed surface as follows:
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.
- e. Paint electrical conduits containing cables rated 600 volts or more using two coats of MPI 9 (Exterior Alkyd Enamel (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, (SEE ROOM FINISH SCHEDULE SHOWN ON DRAWINGS)..
  2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
  3. Painting of ferrous metal and galvanized metal.
  4. Painting of wood with fire retardant paint exposed in attics, when used as mechanical equipment space.
  5. Identity painting and safety painting.
- B. Building and Structural Work not Painted:
1. Prefinished items:
    - a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
    - b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.

- 2. Finished surfaces:
  - a. Hardware except ferrous metal.
  - b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
  - c. Signs, fixtures, and other similar items integrally finished.
- 3. Concealed surfaces:
  - a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
  - b. Inside walls or other spaces behind access doors or panels.
  - c. Surfaces concealed behind permanently installed casework and equipment.

**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:

	COLOR OF	COLOR OF	COLOR OF	LEGEND
PIPING	EXPOSED PIPING	BACKGROUND	LETTERS	BBREVIATIONS

Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Drain Line		Green	White	Drain
Medium Pressure Steam		Yellow	Black	M. P. Stm _____*
Medium Pressure Condensate Return		Yellow	Black	M.P. Ret _____*
Low Pressure Steam		Yellow	Black	L.P. Stm _____*
Low Pressure Condensate Return		Yellow	Black	L.P. Ret _____*
Hot Water Heating Supply		Yellow	Black	H. W. Htg Sup
Hot Water Heating Return		Yellow	Black	H. W. Htg Ret
Gravity Condensate Return		Yellow	Black	Gravity Cond Ret
Pumped Condensate Return		Yellow	Black	Pumped Cond Ret
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
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
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Chemical Resistant Pipe				
Waste		Yellow	Black	Acid Waste
Vent		Yellow	Black	Acid Vent
Atmospheric Vent		Green	White	ATV
Fire Protection Water				
Sprinkler		Red	White	Auto Spr
Standpipe		Red	White	Stand
Sprinkler		Red	White	Drain

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6100 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, 5000 15000 25000.



8. See Sections for methods of identification, legends, and abbreviations of the following:
  - e. Medical Gases and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
  - f. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS / Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS / Section 28 05 33, RACEWAYS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY.

B. Fire and Smoke Partitions:

1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
3. Locate not more than 6100 mm (20 feet) on center on corridor sides of partitions, and with a least one message per room on room side of partition.
4. Use semigloss paint of color that contrasts with color of substrate.

**3.14 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.

- - - E N D - - -

**SECTION 10 14 00  
SIGNAGE**

**SPEC WRITER NOTE:**

**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.
- B. Sign Contractor shall provide graphics and a list of all signs required for this project

**1.2 RELATED WORK**

**1.3 MANUFACTURER'S QUALIFICATIONS**

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
  - B221-06.....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 match existing Surgical Department Room Signs.
  - 3. Character Height: match existing Surgical Department Room Signs.
  - 5. Finish and Contrast: match existing Surgical Department Room Signs..
  - 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.

**1.8 COLORS AND FINISHES:**

Shall match existing Surgical Department Room Signs..

**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. Materials To match existing Surgical Department Room Signs.

## **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**

This section specifies cubicle curtain track (C.C.T.) and intravenous support assembly (I.V).

**1.2 RELATED WORK**

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:
  - One 300 mm (12 inch) long piece of cubicle curtain track with carrier access and end stop.
  - One clip anchor for fastening track to grid system of acoustical ceilings. One curtain carrier.
  - One intravenous support assembly consisting 300 mm (12 inch) long pieces of track, carrier assembly, and bottle pendant.
- C. Shop Drawings: Showing layout of tracks and method of anchorage.
- D. Manufacturer's Literature and Data:
  - Cubicle curtain track.
  - Intravenous support assembly.

**1.4 DELIVERY, STORAGE AND HANDLING**

- A. Deliver material in original package marked to identify the contents, brand name, and the name of the manufacturer or supplier.
- B. Store in dry and protected location. Store so as to not bend or warp the tracks.
- 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):
  - B221-06.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

B456-03.....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.
  2. Tubular Track (Suspended Type): Seamless drawn aluminum tubing, ASTM B221, alloy 6061 temper T6, 25 mm (one inch) outside diameter, not less than 1.5 mm (0.060 inch) wall thickness, slotted for interior carriers.
- B. Curtain Carriers: Nylon or delrin carriers, with either nylon or delrin wheels on metal, delrin, or nylon axles. Equip each carrier with either stainless steel, chromium plated brass or steel hooks with swivel, or nickel chromium plated brass or stainless steel bead chain and hook assembly, or delrin carriers may have moulded on delrin hooks. Hook for bead chain may be the same material and finish as the bead chain or may be chromium plated steel. Provide 2.2 carriers for every 300 mm (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.

### **2.2 INTRAVENOUS SUPPORT ASSEMBLY**

- A. Assembly includes track, carrier assembly, bottle holding pendant, curved track sections and curved connectors, and all components and accessories required for a working installation.

- B. Track: Surface mounted channel or "I" beam shaped, extruded aluminum. Equip track with removable section at splicing clamp for carrier removal. Overall size of track shall be as shown on drawings .
- C. Carrier Assembly: Assembly shall include a body made of either stainless steel or aluminum, and be equipped with four ball bearing nylon wheels and lockstop to insure insulation of carrier from track. Equip carrier with a positive locking device to hold carrier stationary when in use. Provide with either a stainless steel, or chromium plated brass hook for support of bottle holding pendent.
- D. Bottle Holding Pendent: Equip with a minimum of three, stainless steel, chromium plated steel, or chromium plated brass arms connected to adjustable shaft of same material. Adjustable shaft shall permit bottle holding hub to adjust from full height to approximately 1800 mm (six feet), 75 mm (three inches) above finished floor. Provide shaft with a built-in locking device for vertical height adjustments. Locking device shall be activated by push button or similar easily operated one hand control.

### **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: Chemically etched medium matte, with clear anodic coating, Class II Architectural, 0.4 mils thick .

### **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 or suspend from above to form a rigid installation.
- C. Anchor surface mounted curtain tracks directly to exposed grid of lay-in acoustical tile ceilings with suitable fasteners, spaced approximately 600 mm (24 inches) on center.
- D. Anchor surface mounted curtain tracks to concrete, plaster and gypsum board ceilings with a minimum of 3 mm (1/8-inch) diameter fastenings or concealed clips spaced not more than 900 mm (three feet) on center.
- E. Install suspended track seven feet, three inches above the finished floor, with hangers spaced no more than four feet on center. At ceiling line, provide flange fittings secured to hangers with set screws. Secure track to walls with flanged fittings and to hangers with special fittings.
- F. Securely fasten end stop caps to prevent their being forced out by the striking weight of carriers.
- H. Remove damaged or defective components and replace with new components or repair to the original condition.

#### **3.2 ACCEPTANCE**

- A. Track shall be installed neat, rigid, plumb, level and true, and securely anchored to the overhead construction.
- B. Carrier units shall operate smoothly and easily over the full range of travel.

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**SECTION 10 25 13**  
**PATIENT BED SERVICE WALLS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies the furnishing, installation and connection of the patient wall systems both horizontal and vertical. Patient wall systems are also referred to as prefabricated bedside patient units or PBPU's.

**1.2**

**SUBMITTALS**

A. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include electrical ratings, dimensions, mounting details, front view, side view, equipment and device arrangement, wiring diagrams, material, and connection diagrams.
3. Provide configuration drawings showing all possible device (nurse call, medical gases, electrical receptacles and switches, etc.) locations to the COTR. The COTR will provide by return of submittal the desired configuration of each patient wall system. Limit the number and type of devices allowed for each style of unit to the number and type of devices shown on drawings.

B. Manuals: Two weeks prior to the final inspection, deliver four copies of the following to the COTA.

1. Complete maintenance and operating manuals including wiring diagrams, technical data sheets, and information for ordering replacement parts:
  - a. Include complete diagrams for each of the items of equipment, including "As Installed" revisions of the diagrams.
  - b. Identify terminals on the wiring diagrams to facilitate installation, maintenance and operation.

C. Certifications: Two weeks prior to the final inspection, deliver four copies of the following certifications to the COTR

1. Certification by the manufacturer that the equipment conforms to the requirements of the drawings and specifications.

**1.3 APPLICABLE PUBLICATIONS:**

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in text by the basic designation only.
- B. National Fire Protection Association (NFPA):
  - 70-07.....National Electrical Code (NEC)
  - 99-05.....Health Care Facilities
- C. Underwriters Laboratories, Inc. (UL):
  - UL listed in product category SECTIONS AND UNITS (QQXX). This standard used to investigate listed products in this category is NFPA 70 (NEC).

**PART 2 - PRODUCTS****2.1 PATIENT WALL SYSTEMS**

- A. Basis of Design: Shall be a Hill-rom "BASIS MODEL" with Integrated Bed Locator and shall be UL listed.
- B. Shall consist of a structural framework, removable panels and removable equipment console units, factory assembled to house all permanent bedside services including but not necessarily limited to fixtures, grounding jacks, power outlets, telephone outlet, nurses call patient station, medical gas outlet(s) and other fittings or devices.
- C. Shall conform to the following:
  - 1. Applicable requirements in NFPA 70 (NEC) and NFPA 99.
  - 2. Assembly and all components shall be UL listed or labeled.
- D. Coordinate the mounting space provisions for the nurse call equipment with Section 27 52 23, NURSE CALL/CODE BLUE SYSTEMS.
- E. Compressed Air, Oxygen and Vacuum System Equipment: Furnish, install and test the equipment in accordance with the drawings and Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES and Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
  - 1. Fixed medical gas outlets are installed in one location but may be moved without special tools nor shutting off the gas involved.
  - 2. Movable medical gas outlets:
    - a. Hose connected to gas manifold type:
      - 1) The hoses connected to gas manifold shall be UL listed and labeled for the purpose.

- 2) All hoses shall be accessible at all times. No exposed hoses. A panel shall cover the hoses provided it can be easily removed with out the use of special tools for hose inspection.

b. Relocatable type:

- 1) Relocatable or (snap-in), replace with the use of tools to any one of several different fixed locations.
- 2) Appropriate relocatable adapter can be used to access available gases from each fixed location.
- 3) Cover all unused locations with a blank (no gas) adapter plate.

F. Electrical receptacles and switches shall comply with the requirements in Section 26 27 26, WIRING DEVICES; grounding in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS; and internal wiring in Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW).

G. Styles:

1. The styles and manufacturers indicated represent the basis for design to evaluate alternate manufacturers' products and functional capabilities.
2. Style:- A single bed patient wall unit consisting of a horizontal unit and Integrated Patient Bed Locator. Horizontal units shall consist of the configuration and components as shown on the Drawings.. Patient bed light power shall be provided by same manufacturer as the PBPU All electrical devices shall be wired in accordance with the Elevation designations shown on the drawings.
  - a. Provide oxygen gas outlet(s): .
  - b. Provide air outlet (s):.
  - c. Provide vacuum outlet(s): .
  - d. Provide emergency power outlets: 2-each NEMA 20R single receptacles, self illuminated red with stainless steel or anodized aluminum cover plate, engraved "EMERGENCY POWER" with minimum 6 mm (1/4 inch) red filled letters.
  - e. Provide normal power outlets: 3-each NEMA 20R single white receptacles. One of which is for the bed motor. Provide stainless steel or anodized aluminum cover plates.
  - f. Provide Nurses Call audio-visual single bed station.
  - g. Provide a switch for the overhead/exam light.

- h. Patient Light shall include the following:
- 1) Indirect Light
  - 2) Reading Light
  - 3) flip-Over Exam Light with hinge to allow turning forward.
  - 4) Extruded aluminum, painted with lenses.
  - 5) Controlled by low-voltage controller.
  - 6) lamps - 32W/48T8/RS
- H. All styles of the units shall have the following features:
1. Basic structural framework shall be constructed of heavy gage extruded aluminum or minimum 1.9 mm (16 gage) cold-rolled steel, designed to be a self-supporting unit.
  2. Not used.
  3. Provide removable front panels:
    - a. Construct panel of the following materials:
      - 1) Fire retarding core material surfaced with a high pressure plastic laminated facing sheet.
      - 2) Vinyl material heat and pressure applied over a minimum of 1.6 mm (0.060 inch) sheet aluminum back braced for rigidity and sound control.
      - 3) Vinyl material heat and pressure applied over sheet steel minimum 1.6 mm (0.060 inch).
      - 4) Vinyl material heat and pressure applied over sheet aluminum minimum 2.0 mm (0.080 inch).
    - b. Color and texture shall be as selected from the manufacturer's submittal of finish options.
    - c. Bond the panel edges with an aluminum extrusion or cold-rolled steel trim designed for mounting directly to the structural framework, thus allowing the panels to be easily removed for access to internal components and for servicing of utility connections or future modifications. Secure panels with hidden screws or other means to offer an overall finished appearance. All exposed metal surfaces or trims greater than 4 mm (1/8 inch) wide shall be of anodized aluminum or stainless steel finished to resist abrasion and affects from hospital cleaning compounds.
  4. Styles shown in the Drawing Elevations need not have back panels, provided they are edge gasketed to the wall or totally and inconspicuously edge sealed to the wall with a resilient caulking

- material. Attach side [sheet steel, a minimum of 1.6 mm (0.060 inch)] or equivalent strength aluminum side panels, with flush screws to permit close wall mounting. Finish side panels to match or compliment the front panels.
5. Mount patient service components in an equipment console made up of a backbox and finish fascia.
    - a. Use galvanized steel backbox with outlet gang openings on minimum 60 mm (2.4 inches) uniform centers to provide mounting supports of front panel devices. Provide removable metal barriers to separate voltage sources and to facilitate wiring between segregated devices within the same horizontal module.
    - b. Match finish, either anodized aluminum or stainless steel of all fascia and device face plates.
    - c. Fascia and/or face plates may be omitted for power and grounding receptacles in the consoles if the receptacles are mounted flush in the PBPV cover panel and facilities (support members, tapped holes, spacing, etc.) are provided behind the panel for future addition or relocation of receptacles.
    - d. Provide smooth external surfaces having a finished appearance. Maintain adequate spacing of device plates and similar items to eliminate crevices and facilitate cleaning.
  6. Provide patient services as indicated on the drawings, provide a schematic wiring diagram, and as follows:
    - a. Electrical components: Factory assembled and prewired to a sectionalized junction box at the top of the unit in accordance with circuiting and switching arrangements shown on the drawings. Factory assembled pre-wiring may be stranded in sizes AWG #10 and #12. Provide an equipotential ground bus with lugs suitable for connecting AWG #14 to AWG #6 conductors with a minimum of 48 screw-type terminals, unless otherwise shown.
    - b. Receptacles: Single Hospital Grade NEMA 5-20R, unless otherwise specified.
    - c. Provide medical gas components compatible with those installed elsewhere in the project that are factory assembled, manifolded and pre-piped, using medical grade copper pipe, to single point connections of each service at the top of the units.

- d. Provide nurse call services consisting of provisions for adequate space and matching face plates for the equipment and empty conduit to the sectionalized junction box at the top of the unit.
- e. Provide internal power and signal wiring in separate EMT, flexible metal conduits or approved raceway. Separate normal power circuits from emergency power circuits. Also, provide adequate supports for conduits and piping within the structural frame.
- f. Telephone outlets/jacks: Plug-in type as approved by the VAMC.
- g. Except for anodized aluminum and galvanized or stainless steel surfaces, clean and paint all other metal surfaces at the factory with primer and not less than two coats of baked enamel.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION:**

- A. Installation shall be in accordance with NFPA 70 (NEC), NFPA 99, and as shown on the drawings.
- B. Compressed Air, Oxygen and Vacuum System Equipment:
  - 1. Install and test the equipment and piping system in accordance with the drawings and Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES and Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.

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**SECTION 10 26 00  
WALL AND DOOR PROTECTION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies wall guards (crash rails or bumper guards), handrail/wall guard combinations, corner guards and door/door frame protectors and high impact wall covering .

**1.2 RELATED WORK**

- B. Armor plates and kick plates not specified in this section: Section 08 71 00, DOOR HARDWARE.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Show design and installation details.
- C. Manufacturer's Literature and Data:
1. Handrail/Wall Guard Combinations.
  2. Wall Guards.
  3. Corner Guards.
  4. Door/Door Frame Protectors.
  5. High Impact Wall covering.
- D. Test Report: Showing that resilient material complies with specified fire and safety code requirements.

**1.4 DELIVERY AND STORAGE**

- A. Deliver materials to the site in original sealed packages or containers marked with the name and brand, or trademark of the manufacturer.
- B. Protect from damage from handling and construction operations before, during and after installation.
- C. Store in a dry environment of approximately 21° C (70 degrees F) for at least 48 hours prior to installation.

**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 .
- 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 type of 30 mm (1-1/4 inch radius) 6 mm 1/4-inch corner) formed to profile shown.
1. Snap-on corner guard formed from resilient material, minimum 2 mm (0.078-inch) thick, free floating on a continuous 1.6 mm (0.063-inch) thick extruded aluminum retainer. Design retainer used for flush mounted type to act as a stop for adjacent wall finish material. Provide appropriate mounting hardware, cushions and base plates as required.
  2. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.
  3. Flush mounted corner guards installed on any fire rated wall shall maintain the fire rating of the wall. Provide fire test of proposed corner guard system to verify compliance.
    - a. Where insulating materials are an integral part of the corner guard system, the insulating materials shall be provided by the manufacturer of the corner guard system.
    - b. All exposed metal in fire rated assemblies shall have a paintable finish.
- 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.
- B. Aluminum Wall Guards: Extruded aluminum, closed tubular bumper assembly mounted on wall brackets as shown.
1. Provide wall bumper with factory fabricated end closure caps, and inside and outside corner assemblies, concealed splice plates, and other accessories standard with the manufacturer.
  2. Fabricate tubular wall guards from material with a nominal wall thickness of 6 mm (0.250-inch), form grooves for and provide two strips of continuous polyvinyl chloride cushion bumper inserts.
  3. Fabricate adjustable wall brackets from aluminum having a nominal wall thickness of 5 mm (0.20-inch). Fasten bumper to brackets with 6 mm (1/4-inch) diameter aluminum or stainless steel bolts with locknuts.
- C. Stainless Steel Wall Guards: Construct wall guard, including brackets, of minimum 4.75 mm (0.1875-inch) thick stainless steel to design shown.

#### **2.4 DOOR AND DOOR FRAME PROTECTION**

- A. Fabricate door and door frame protection items from vinyl acrylic or polyvinyl chloride resilient material, minimum 1.5 mm (0.060-inch) thick, for doors and 0.9 mm (0.035-inch) thick for door frames, as shown on drawings.
- B. Coordinate door and door frame protection material requirements with door and frame suppliers to insure fit for all components, and color as specified.
- C. Provide adhesive as recommended by resilient material manufacturer.

#### **2.5 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 guard rail protection material and supplier for proper fit, installation and color.
- C. Provide adhesive as recommended by the wall covering manufacturer.

#### **2.6 FASTENERS AND ANCHORS**

- A. Provide fasteners and anchors as required for each specific type of installation.

- B. Where type, size, spacing or method of fastening is not shown or specified, submit shop drawings showing proposed installation details.

## **2.7 FINISH**

- A. In accordance with NAAMM AMP 500 series.
- B. Aluminum:
  - 2. Concealed aluminum: Mill finish as fabricated, uniform in color and free from surface blemishes.
- C. Stainless Steel: NAAMM finish Number 4.
- D. 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**

Mount guards on external corners of interior walls, partitions and columns as shown.

### **3.3 RESILIENT HANDRAIL WALL GUARD COMBINATIONS AND RESILIENT WALL GUARDS (CRASH RAIL)**

Secure guards to walls with mounting cushions brackets and fasteners in accordance with manufacturer's details and instructions.

### **3.5 STAINLESS STEEL WALL GUARDS**

Space brackets at not more than three feet on centers and anchor to the wall in accordance with manufacturer's installation instructions.

### **3.6 DOOR, DOOR FRAME PROTECTION AND HIGH IMPACT WALL COVERING**

- A. Surfaces to receive protection shall be clean, smooth and free of obstructions.
- B. Install protectors after frames are in place but preceding installation of doors in accordance with approved shop drawings and manufacturers specific instructions.
- C. Apply with adhesive in controlled environment according to manufacture's recommendations.
- D. Protection installed on fire rated doors and frames shall be installed according to NFPA 80 and installation procedures listed in UL Building Materials Directory; or, equal listing by other approved independent testing laboratory establishing the procedures.

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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: (10800-1.DWG).
  - 6. Shower curtain rods: (10800-2.DWG) and (10800-3.DWG).
  - 7. Clothes hooks, robe or coat.
  - 8. Towel bars.
  - 9. Metal framed mirror: (10800-7.DWG).
  - 10. Medicine cabinet.
  - 11. Foot operated soap dispenser.
  - 12. Soap dishes.
  - 13. Paper cup dispenser.
  - 14. Mop racks.
  - 15. Stainless steel shelves, Type 44. (10801-1.DWG)
  - 16. Stainless steel shelves at wheelchair lavatory.
- B. This section also specifies custom fabricated items used in toilets and related spaces.

**1.2 RELATED WORK**

- A. Color of finishes: SEE FINISH SCHEDULE SHOWN ON DRAWINGS

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
  - 1. Each product specified.
  - 2. Paper towel dispenser and combination dispenser and disposal units.
  - 3. Metal framed mirrors, showing shelf where required, fillers, and design and installation of units when installed on ceramic tile wainscots and offset surfaces.
  - 4. Shower Curtain rods, showing required length for each location.

5. Grab bars, showing design and each different type of anchorage.
6. Medicine cabinets showing design and installation.
7. Foot operated soap dispenser, showing anchorage and components.
8. Show material and finish, size of members, and details of construction, installation and anchorage of mop racks.

C. Samples:

1. One of each type of accessory specified.
2. After approval, samples may be used in the work.

D. Manufacturer's Literature and Data:

1. All accessories specified.
2. Show type of material, gages or metal thickness in inches, finishes, and when required, capacity of accessories.
3. Show working operations of spindle for toilet tissue dispensers.
4. Mop racks.

E. Manufacturer's Certificates:

1. Attesting that soap dispensers are fabricated of material that will not be affected by liquid soap or aseptic detergents, PhisoHex and solutions containing hexachlorophene.
2. Anodized finish as specified.

#### **1.4 QUALITY ASSURANCE**

- A. Each product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each accessory type shall be the same and be made by the same manufacturer.
- C. Each accessory shall be assembled to the greatest extent possible before delivery to the site.
- 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(R2004).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
  - A176-99(R2004).....Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
  - A269-07.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service
  - A312/A312M-06.....Seamless and Welded Austenitic Stainless Steel Pipes
  - A653/A653M-07.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - B221-06.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
  - B456-03.....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
  - D635-06.....Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position
  - F446-85 (R2004).....Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.
  - A269-07.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service
  - D3453-01.....Flexible Cellular Materials - Urethane for Furniture and Automotive Cushioning, Bedding, and Similar Applications

D3690-02.....Vinyl-Coated and Urethane-Coated Upholstery  
Fabrics

C. The National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500 Series.....Metal Finishes Manual

AMP 500-505-88.....Metal Finishes Manual and Finishes for  
Stainless Steel

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**

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, and for mirror  
doors in medicine cabinets.

2. ASTM C1036, Type 1 Class 1 Quality q3, for shelves in medicine  
cabinets.

3. ASTM C1048, Kind FT, Condition A, Type 1, Class 1 (use in Mental  
Health and Behavior Nursing Unit Psychiatric Patient Areas and  
Security Examination Rooms where mirrors and glass are specified).

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.
- C. 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 COMBINATION PAPER TOWEL DISPENSER AND DISPOSAL UNITS**

- A. Recessed and semi-recessed type.
- B. Dispensing capacity for 400 sheets of any type of paper toweling.
- C. Fabricate of stainless steel.
- D. Form face frames, from one piece.
- E. Provide each door with continuous stainless steel piano hinge and tumbler lock, keyed alike.
- F. Provide removable waste receptacle approximately 40 liter (10.5 gallon) capacity, fabricated of 0.45 mm (0.018-inch) thick stainless steel.

#### **2.7 WASTE RECEPTACLES**

- A. Semi-recessed type, without doors. Fed. Spec WW-P-541, Type II.
- B. Fabricate of stainless steel.
- C. Form face frame from one piece.
- D. Provide removable waste receptacle of approximately (12 gallon) capacity, fabricated of stainless steel.
- E. Waste receptacle key locked in place.

#### **2.8 TOILET TISSUE DISPENSERS**

- A. Double roll surface mounted type.
- B. Mount on continuous backplate.
- C. Removable spindle ABS plastic or chrome plated plastic.
- D. Wood rollers are not acceptable.

## 2.9 GRAB BARS

- A. Fed. Spec WW-P-541/8B, Type IV, bars, surface mounted, Class 2, grab bars and ASTM F446.
- B. Fabricate of stainless steel throughout the project:
  - 1. Stainless steel: Grab bars, flanges, mounting plates, supports, screws, bolts, and exposed nuts and washers.
- C. Concealed mount.
- 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.

## 2.11 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.

## 2.13 METAL FRAMED MIRRORS

- A. Fed. Spec. A-A-3002 metal frame; stainless steel, type 302 or 304.
- B. Mirror Glass:
  - 1. Minimum 6 mm (1/4 inch) thick.
  - 2. Set mirror in a protective vinyl glazing tape.

3. Use tempered glass for mirrors in Mental Health and Behavioral Nursing units.

C. Frames:

1. Channel or angle shaped section with face of frame not less than 9 mm (3/8 inch) wide. Fabricate with square corners.
2. Use either 0.9 mm (0.0359 inch) thick stainless steel, chrome finished steel, or extruded aluminum, with clear anodized finish 0.4 mils thick.
3. Filler:
  - a. Where mirrors are mounted on walls having ceramic tile wainscots not flush with wall above, provide fillers at void between back of mirror and wall surface.
  - b. Fabricate fillers from same material and finish as the mirror frame, contoured to conceal the void behind the mirror at sides and top.
4. Attached Shelf for Mirrors:
  - a. Fabricate shelf of the same material and finish as the mirror frame.
  - b. Make shelf approximately 125 mm (five inches) in depth, and extend full width of the mirror.
  - c. Close the ends and the front edge of the shelf to the same thickness as the mirror frame width.
  - d. Form shelf for aluminum framed mirror as an integral part of the bottom frame member. Form stainless steel shelf with concealed brackets to attach to mirror frame.

D. Back Plate:

1. Fabricate backplate for concealed wall hanging of either zinc-coated, or cadmium plated 0.9 mm (0.036 inch) thick sheet steel, die cut to fit face of mirror frame, and furnish with theft resistant concealed wall fastenings.
2. Use set screw type theft resistant concealed fastening system for mounting mirrors.

E. Mounting Bracket:

1. Designed to support mirror tight to wall.
2. Designed to retain mirror with concealed set screw fastenings.

## 2.18 MOP RACKS

- A. Minimum 1.0M (40 inches) long with five holders.

## B. Clamps:

1. Minimum of 1.3 mm (0.050-inch) thick stainless steel bracket retaining channel with a hard rubber serrated cam; pivot mounted to channel.
2. Clamps to hold handles from 13 mm (1/2-inch) minimum to 32 mm (1-1/4 inch) maximum diameter.

## C. Support:

1. Minimum of 1 mm (0.0375 inch) thick stainless steel hat shape channel to hold clamps away from wall as shown.
2. Drill wall flange for 3 mm (1/8 inch) fasteners above and below clamp locations.

D. Secure clamps to support with oval head machine screws or rivets into continuous reinforcing back of clamps.

E. Finish on stainless Steel: AMP 503-No. 4.

**2.19 STAINLESS STEEL SHELVES (TYPE 44)**

## A. Shelves:

1. Fabricate shelves of 1.2 mm (0.0478-inch) thick sheet to size and design shown.
2. Fabricate shelves of hollow metal type construction, forming a depression as shown, with closed fronts, backs, ends and bottoms. Reinforce shelves with 1.2 mm (0.0478-inch) thick sheet steel hat channel stiffeners, full depth, welded to underside of top at bracket locations.
3. Miter cuts, where made at corners of shelves, continuously welding.

B. Form brackets of 3 mm (1/8-inch) thick steel as shown. Drill brackets for 6 mm (1/4-inch) anchor bolts.

C. Weld or Screw brackets to shelves.

**2.20 STAINLESS STEEL SHELVES, TYPES 45.**

A. Fabricate shelves and brackets to design shown of 1.2 mm (0.0478-inch) thick stainless steel.

B. Round and finish smooth projecting corners of shelves and edge corners of brackets. Drill brackets for 6 mm (1/4-inch) anchor bolts.

C. Screw or weld brackets to shelves.

**2.21 STAINLESS STEEL SHELVES AT WHEELCHAIR LAVATORY**

## A. Side wall mounted:

1. Fabricate to size and shape shown of 1.2 mm (0.0478 inch) thick sheet.

2. Turn up edges and weld corners closed.
  3. Fabricate brackets and weld to shelf. Drill brackets for 6 mm (1/4 inch) anchor bolts.
- B. Back wall mounted:
1. Fabricate to size and shape shown of plate and tube.
  2. Turn up edges and weld corners of shelf.
  3. Weld tube to back plate and shelf, weld back plate to shelf, filler plate to tube, and corners of shelf with continuous welds.
  4. Drill back plate for 6 mm (1/4 inch) anchor bolts.

### **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.
- C. Install accessories in accordance with the manufacturer's printed instructions and ASTM F446.
- D. Install accessories plumb and level and securely anchor to substrate.
- E. Install accessories in a manner that will permit the accessory to function as designed and allow for servicing as required without hampering or hindering the performance of other devices.
- F. Position and install dispensers, and other devices in countertops, clear of drawers, permitting ample clearance below countertop between devices, and ready access for maintenance as needed.
- G. Align mirrors, dispensers and other accessories even and level, when installed in battery.
- H. Install accessories to prevent striking by other moving, items or interference with accessibility.
- I. Install wall mirrors in Mental Health and Behavioral Units with tamper resistant screws that are flush mounted so that they will not support a rope or material for hanging.

**3.3 SCHEDULE OF ACCESSORIES**

**3.4 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**

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):  
D4802-02.....Poly (Methyl Methacrylate) Acrylic Plastic  
Sheet

**PART 2 - PRODUCTS****2.1 FIRE EXTINGUISHER CABINET**

Recessed type with flat trim of size and design shown.

**2.2 FABRICATION**

- A. Form body of cabinet from 0.9 mm (0.0359 inch) thick sheet steel.
- B. Fabricate door and trim from 1.2 mm (0.0478 inch) thick sheet steel with all face joints fully welded and ground smooth.
  - 1. Glaze doors with 6 mm (1/4 inch) thick ASTM D4802, clear acrylic sheet, Category B-1, Finish 1.
  - 2. Design doors to open 180 degrees.
  - 3. Provide continuous hinge, pull handle, and adjustable roller catch.

**2.3 FINISH**

- A. Finish interior of cabinet body with baked-on semigloss white enamel.
- B. Finish door, frame with manufacturer's standard baked-on prime coat suitable for field painting.



**PART 3 - EXECUTION**

- A. Install fire extinguisher cabinets in prepared openings and secure in accordance with manufacturer's instructions.
- B. Install cabinet so that bottom of cabinet is 975 mm (39 inches) above finished floor.

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**SECTION 11 73 00**  
**CEILING MOUNTED PATIENT LIFT SYSTEM**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

Ceiling Mounted Patient Lift Systems for the transfer of physically challenged patients are specified in this section.

**1.2 RELATED WORK**

- A. Section 01 00 00, GENERAL REQUIREMENTS: Requirements for pre-test of equipment.
- B. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Seismic requirements for non-structural equipment.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General Electrical Requirements and items, which are common to sections of Division 26.

**1.3 QUALITY ASSURANCE**

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

### 2.0 LIFT SYSTEM

The overhead, ceiling mounted patient lift system shall be complete with track system, lift units, motors, slings and complete structural mounting system to attach to the existing structural roof system.

Basis of Design: Provide a complete system, Guldman Hoist System GH2 with GH2 HD Twin lifting modules for 455 kg (1000 lbs) capacity.

### 2.1 CEILING TRACK SYSTEM

The Ceiling Track shall be made from high strength extruded aluminum T66081-T5 at a thickness of 3/16" (4.8mm). Provide anchor supports at a minimum 3 per linear foot at ceiling substrate. The ceiling track shall be finished with baked enamel paint.

**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: V0 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**

Training shall be provided for the required personnel to educate them on proper operation and maintenance for the lift system equipment.

**3.3 TEST**

Conduct performance test, in the presence of the 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 31 00**  
**MANUFACTURED METAL CASEWORK**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies metal casework and related accessories, including base cabinets, wall cabinets, and full height cabinets.
- B. Items specified in this section:
  - 1. Hospital Casework: including metal casework of the following types:
    - a. Wardrobe Cabinet, Metal, .
    - b. Wall Cabinet, Metal, .
    - c. Base Cabinets and Counter Tops

**1.2 RELATED WORK**

- A. Color of casework finish: Manufacturer Standard Finishes.
- B. Electrical & Plumbing Components: Replacement of existing fixtures to Match Existing.

**1.3 QUALITY ASSURANCE**

- A. Approval by Contracting Officer of proposed manufacturer, or suppliers, will be based upon submission by Contractor certification that, manufacturer regularly and presently manufactures casework specified as one of their principal products.
- B. Installer has technical qualifications, experience, trained personnel, and facilities to install specified items.
- C. Furnish supervision of installation at construction site by a qualified technician regularly employed by casework installer.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Certificates:
  - 1. Manufacturer's Certificate of qualifications specified and finish on casework.
  - 2. Contractor's Certificate of installer's qualifications specified.
  - 3. Safety glass meets requirements of ANSI Standard Z97.1.
- C. Manufacturer's Literature and Data:
  - 1. Brochures showing name and address of manufacturer, and catalog or model number of each item incorporated into the work.
  - 2. Manufacturer's illustration and detailed description.
  - 3. List of deviations from contract specifications.

4. Locks, each kind

D. Shop Drawings (1/2 Full Scale):

- 1. Showing details of casework construction, including kinds of materials and finish, hardware, accessories and relation to finish of adjacent construction, including specially fabricated items or components.
- 2. Fastenings and method of installation.
- 3. Location of service connections and access.

E. Samples:

- 1. Metal plate, 150 mm (six inch) square, showing chemical resistant finish, in each color.
- 2. One complete casework assembly, including cabinet(s) with drawers and cupboard.
- 3. One glazed sliding door with track and pertinent hardware. A complete cabinet may be submitted to fulfill this requirement.
- 4. Cabinets for subsequent installation may be submitted for above requirements.

**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):

- A36/A36M-08.....Carbon Structural Steel
- A167-99(R 2009).....Stainless and Heat-Resisting Chromium Steel  
Plate Sheet and Strip
- A283/A283M-03(R 2007)...Low and Intermediate Tensile Strength Carbon  
Steel Plates
- A568/A568M-09.....Steel, Sheet, Carbon and High-Strength, Low-  
Alloy Hot-Rolled and Cold-Rolled, General  
Requirements
- A794/A794M-09.....Standard Specification for Commercial Steel  
(CS), Sheet, Carbon (0.16% Maximum to 0.25%  
Maximum) Cold Rolled
- B456-03(R2009).....Electrodeposited Coatings of Copper Plus Nickel  
Plus Chromium and Nickel Plus Chromium
- C1036-06.....Flat Glass

C. American National Standard Institute:

- Z97.1-09.....Safety Glazing Material used In Buildings
- D. Builders Hardware Manufacturers Association (BHMA):
- A156.1-06.....Butts and Hinges
- A156.9-10.....Cabinet Hardware
- A156.5-10.....Auxiliary Locks and Associated Products
- A156.11-10.....Cabinet Locks
- A156.16-02.....Auxiliary Hardware
- E. American Welding Society (AWS):
- D1.1-10.....Structural Welding Code Steel
- D1.3-08.....Structural Welding Code Sheet Steel
- F. National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500-505-06 Series...Metal Finishes Manual
- G. U.S. Department of Commerce, Product Standard (PS):
- PS 1-95.....Construction and Industrial Plywood
- H. Federal Specifications (Fed. Spec.):
- FF-N-836D.....Nut, Square, Hexagon Cap, Slotted, Castle  
Knurled, Welding and Single Ball Seat
- A-A-55615.....Shield, Expansion; Nail Expansion (Wood Screw  
and Lag Bolt Self-Threading Anchors)

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Modular Casework (refer to attached plan for locations, layouts and sizes)with coordination of plumbing for installed sink units as noted on attached plans)
1. Countertops - Corian solid surface - color - Tumbleweed (standard).375" radius edge with 1"x3"high backspash 25"deep (includes backsplash thickness)
  2. Cabinet finish - premium quality powder coat baked-on epoxy finish in Midmark Pebble Grey color.
  3. Casework assembly shall consist of individual, interchangeable, integral, modular units comprising assembly layout as per attached drawings
  4. 18 and 20 gauge cold rolled steel construction with single-piece shell and bottom frame design, pressed and joined (Tog-L-Loc)



5. All required fillers and trim shall coordinate with standard color - Pebble Grey
6. Deep drawer units shall be one piece molded polystyrene drawer bodies with rounded corners
7. Door and drawer construction shall be Front/back panels shall be 12 Mil. Seamless polymer-covered front with melamine back
8. Door and drawer Cores shall be 45 lb. NAUF MDF board, ¾" thick
9. Drawer slides shall be 88lb. capacity and heavy duty 150lb. capacity slide for file drawers and pull-out waste units.
10. Pulls shall be recessed and integrated front panel design with clear snap-on handle with interchangeable color strips, and provide optional labeling system
11. Hinges shall be standard Blum concealed self-closing, 110 degree opening, nickel plated metal
12. Adjustable shelving - 20 gauge cold rolled steel, painted to match cabinet exterior color with standard reinforced nylon support clips; 36" and wider shelves use 18 gauge cold rolled steel
13. Locks - doors shall be standard Timberline, individually mounted cam style or deadbolt orientation with removable lock plug, keyed alike with two keys per lock. Drawers shall have timberline lock body with removable lock plug with 14 gauge cold rolled steel pivoting lock bar for central lock system, keyed alike with two keys per lock.
14. Plumbing fixtures - sinks and faucets as selected to Match Existing (refer to drawings for locations)
15. All finishes shall be chemical resistance of finish to acid, solvents and bases and salts
16. Five year warranty from date of delivery to the original owner
17. One year warranty from date of delivery to the original owner for countertop surfaces and accessories

## **2.2 MANUFACTURED PRODUCTS**

### **A. MANUFACTURER DATA/CRITERIA SHEET**

1. Manufacturer: Midmark® Corporation. Other manufacturers desiring approval shall demonstrate compliance of essential characteristics with requirements of this specification.
2. Product: Midmark Healthcare Casework Series

3. Finish/Color: Premium quality powder coat, baked-on epoxy; Midmark Pebble Grey Color.
4. Casework Assembly:
  - a. Design: Individual, interchangeable, integral, modular units comprising a desired assembly.
  - b. Cabinet: 18 and 20 gauge cold rolled steel; single-piece shell and bottom frame design; press joined (Tog-L-Loc®)
  - c. Filler and Trim: Manufacturer's standard coordinated components.
  - d. Drawers:
    - 1) Deep Drawer Construction: One piece molded polystyrene drawer bodies with rounded corners; manufacturer's color coordinated with cabinet color.
    - 2) File Drawer Construction: 20 gauge cold rolled steel frame; including suspended file system and file bars.
    - 3) Front/Back: 12 Mil. Seamless polymer-covered front; melamine back.
    - 4) Core: 45 lb. LEED IEQ compliant MDF board, 3/4 inch thick. All composite wood material to meet CARB P2 emission std of CARB regulation 91320.2
    - 5) Slide: Manufacturer's standard Hettich Quadro (88 lb. capacity) and heavy duty Accuride Model 3640 (200 lb capacity) slide for file drawers.
    - 6) Pulls: Recessed and integrated front panel design; clear snap-on handle with interchangeable color strips, and optional labeling system.
  - e. Door Construction:
    - 1) Front/Back: 12 Mil. Seamless polymer-covered front; melamine back.
    - 2) Core: 45 lb. LEED IEQ compliant MDF board, 3/4 inch thick. All composite wood material to meet CARB P2 emission std of CARB regulation 91320.2
    - 3) Hinges: Manufacturer's standard Blum®, concealed, self-closing, 110□Manufacturer's standard Blum□□

- 4) Pulls: Recessed and integrated front panel design; clear snap-on handle with interchangeable color strips, and optional labeling system.
- f. Adjustable Shelving: 20 gauge cold rolled steel, painted to match cabinet color; manufacturer's standard reinforced nylon support clips; 36" and wider shelves use 18 gauge cold rolled steel.
- g. Locks:
  - 1) Doors: Manufacturer's standard Timberline, individually mounted, cam style lock or deadbolt orientation with removable lock plug; locks keyed alike with two keys per lock.
  - 2) Drawers: Manufacturer's standard Timberline lock body with removable lock plug with 14 gauge cold rolled steel pivoting lock bar for central lock system; locks keyed alike with two keys per lock.
- h. Casters: Manufacturer's standard Gross Stabil®, 2" or 3" twin wheel design, stem mounting; locking urethane wheel.
- i. Countertops: As described in "Top Schedule" indicated on drawings.
  - 1) Standard Countertops: NAUF phenolic resin particle board core. All composite wood material to meet CARB P2 emission std of CARB regulation 91320.2
  - 2) Horizontal: High pressure laminate surfacing material is .045 inch thick, matte finish.
- j. Plastic Laminate: Wilsonart; Formica®, Nevamar®, Pionite®; as selected.
- k. Accessories:
  - 1) Plumbing Fixtures: Sinks: (As Selected), Faucets: (As Selected)
  - 2) Task Lights: Light Corporation, Standard 9 ft cord, Optional hard wiring or daisy chain system., Prismatic Acrylic lens, NPF ballast, UL listed and CSA certified, T8 cool white lamps, 18" and 36" length options.
  3. Vertical: Melamine, suede finish.

4. Filler Panel/Leg Support: Particle board, 45 lb. - 48 lb. density.

L. Project-Specific Specials: As indicated on drawings.

### **PART 3 - EXECUTION**

#### **3.1 COORDINATION**

- A. Before installing casework, verify wall and floor surfaces covered by casework have been finished.
- B. Verify location and size of mechanical and electrical services as required.
- C. Verify reinforcement of walls and partitions for support and anchorage of casework.

#### **3.2 FASTENINGS AND ANCHORAGE**

- A. Do not anchor to wood ground strips.
- B. Provide hat shape metal spacers where fasteners span gaps or spaces.
- C. Use 6 mm (1/4 inch) diameter toggle or expansion bolts, or other appropriate size and type fastening device for securing casework to walls or floor. Use expansion bolts shields having holding power beyond tensile and shear strength of bolt and breaking strength of bolt head.
- D. Use 6 mm (1/4 inch) diameter hex bolts for securing cabinets together.
- E. Use 6 mm (1/4 inch) by minimum 38 mm (1-1/2 inch) length lag bolt anchorage to wood blocking for concealed fasteners.
- F. Use not less than No. 12 or 14 wood screws with not less than 38 mm (1-1/2 inch) penetration into wood blocking.
- G. Space fastening devices 300 mm (12 inches) on center with minimum of three fasteners in 900 or 1200 mm (three or four foot) unit width.
- H. Anchor floor mounted cabinets with a minimum of four bolts through corner gussets. Anchor bolts may be combined with or separate from leveling device.
- I. Secure cabinets in alignment with hex bolts or other internal fastener devices removable from interior of cabinets without special tools. Do not use fastener devices which require removal of tops for access.
- J. Where units abut end to end anchor together at top and bottom of sides at front and back. Where units are back to back anchor backs together at corners with hex bolts placed inconspicuously inside casework.
- K. Where type, size, or spacing of fastenings is not shown or specified, show on shop drawings proposed fastenings and method of installation.

### 3.3 CLOSURES AND FILLER PLATES

- A. Close openings larger than 6 mm (1/4 inch) wide between cabinets and adjacent walls with flat, steel closure strips, scribed to required contours, or machined formed steel fillers with returns, and secured with sheet metal screws to tubular or channel members of units, or bolts where exposed on inside.
- B. Where ceilings interfere with installation of sloping tops, omit sloping tops and provide flat steel filler plates.
  - 1. Secure filler plates to casework top members, unless shown otherwise.
  - 2. Secure filler plates more than 150 mm (six inches) in width top edge to a continuous 25 by 25 mm (one by one inch) 0.889 mm thick steel formed steel angle with screws.
  - 3. Anchor angle to ceiling with toggle bolts.
- C. Install closure strips at exposed ends of pipe space and offset opening into concealed space.
- D. Paint closure strips and fillers with same finishes as cabinets.
- E. Caulk and seal laboratory furniture as specified in Section 07 92 00, JOINT SEALANTS.

### 3.4 CABINETS

- A. Install in available space; arranged for safe and convenient operation and maintenance.
- B. Align cabinets for flush joints except where shown otherwise.
- C. Install cabinets level with bottom of wall cabinets in alignment and tops of base cabinets aligned.
- D. Install corner cabinets with hinges on corner side with filler or spacers sufficient to allow opening of drawers.
- E. Plug Buttons:
  - 1. Install plug buttons in predrilled or prepunched perforations not used.
  - 2. Use chromium plate plug buttons or buttons finish to match adjacent surfaces.
- F. Cabinets 6D: Ground to nearest cold water pipe in accordance with NFPA, Underwriters Laboratories, Inc., or other nationally recognized laboratory approved ground specified system.

### 3.5 PROTECTION TO FIXTURES, MATERIALS, AND EQUIPMENT

- A. Tightly cover and protect cabinets against dirt, water chemical or mechanical injury.

B. Thoroughly clean interior and exterior of cabinets, at completion of all work.

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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.

**1.2 RELATED WORK**

- A. Color and patterns, As selected from Mfg's submittals of standard colors.
- B. 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.

**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):
  - A112.18.1-05.....Plumbing Supply Fittings
  - A112.1.2-04.....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

- A1008-09.....Steel, Sheet, Cold-Rolled, Carbon, Structural,  
High Strength, Low Alloy
- D256-06.....Pendulum Impact Resistance of Plastic
- D570-98(R2005).....Water Absorption of Plastics
- D638-08.....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. Stainless Steel
- B. Molded Resin Solid Surface
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.
  2. Performance properties required:

Property	Result	Test
Elongation	0.3% min.	ASTM D638
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

Property	Result	Test
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.

#### 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.
- J. Metal Counter Tops:

1. Fabricate up to 3600 mm (12 feet) long in one piece, including nosing, backs and ends.
  2. When counter tops exceed 3600 mm (12 feet) in length accurately fitted field joints are acceptable.
  3. Finish thickness at edges 32 mm (1-1/4 inch).
  4. Reinforced with minimum 1.5 mm (0.0598 inch) thick hat channel stiffeners, minimum of two stiffeners for units without sinks and three stiffeners for units with sinks welded or soldered to underside of top full length, except at sink openings.
  5. Apply sound deadening material on underside.
  6. Flange edges of tops down 32 mm (1-1/4 inch) and reinforce with concealed hardwood or with a steel frame.
  7. Grind welds smooth and finished on exposed surfaces to match finish specified.
  8. Stainless Steel Counter or Sink Tops:
    - a. Where noted stainless steel except where specified for nourishment unit, unit kitchen, and medicine cabinet.
    - b. Use 1.5 mm (0.0598 inch) thick stainless steel.
    - c. Depth of splash backs and splash ends 25 mm (one inch) and turned down at least 13 mm (1/2 inch) at wall. Where faucets are located in splash backs, fabricate depth of splash backs 50 mm (2 inches) with provision made to receive required fixture.
    - d. Where sinks occur fabricate top with 5 mm (3/16 inch) marine edge and fit flush with adjacent tops of other materials.
    - e. Weld sink flush to counter top and finish to appear seamless.
- K. Molded Resin Tops:
1. Molded resin with drip groove cut on underside of overhanging edge.
  2. Finish thickness of top minimum 25 mm (1 inch).
  3. Joints: Epoxy Type.
  4. Secure reagent shelves to counter tops with fasteners from underside and seal seam.
  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.
- F. Range Tops, Electrical Outlets, Film Viewer:
- 1. Set in cutouts with manufacturers gasket sealing joint with top to prevent water leakage.
  - 2. Install control unit and electric outlets where shown. Seal escutcheon plate at lap if on counter or top to prevent water leakage.

**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 49 00  
RADIATION PROTECTION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies lead radiation shielding.
- B. Construction of products and assemblies used for radiation shielding complying with applicable requirements of NCRP Reports 147 and 102.
- C. This section includes the following items:
  - 1. Lead Lined Wood Doors
  - 2. Lead Lined Shields
  - 3. Lead Glass
  - 4. Lead Lined Frames
  - 5. Thresholds
  - 6. Cassette Transfer Cabinets
  - 7. Lead Louvers
  - 8. Lead Lined Concrete Masonry Units
  - 9. Lead Sheet
  - 10. Lead Lined Plywood
  - 11. Lead Lined Gypsum Lath
  - 12. Lead Lined Gypsum Wallboard

**1.2 RELATED WORK**

- A.
- B. Not Used.
- C. Wood Veneer finish for doors: Section 08 14 00, WOOD DOORS, and Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Steel door frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- E. Hardware for doors: Section 08 71 00, DOOR HARDWARE.
- F. Installation of Doors and Hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES / Section 08 14 00, WOOD DOORS / Section 08 71 00, DOOR HARDWARE / /.

**1.3 MANUFACTURERS QUALIFICATIONS**

- A. Approval by Contracting Officer is required of product or service of proposed manufacturer and suppliers, and will be based upon submission by Contractor of certification that:
  - 1. Manufacturer regularly and presently manufactures lead radiation shielding as specified as one of its principal products.

2. Manufacturer's product submitted has been in satisfactory and efficient operation or three installations similar and equivalent to this project for three years.

3. Manufacturer submits list of installations.

#### **1.4 TESTS**

- A. Lead radiation shielding will be tested at the expense of the Government after X-ray equipment is installed.
- B. Any additional testing required due to correction and replacement of defective work will be done by the Government at Contractor's expense.

**NOTE:** Lead glass, lead lined concrete masonry units, lead lined gypsum lath, lead lined gypsum wallboard and lead lined plywood will not be tested prior to installation.

#### **1.5 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Each lead radiation shielding item specified showing thickness of lead, details of construction and installation.
- C. Samples:
  - 1. Lead lined concrete masonry units, gypsum lath and gypsum wallboard.
  - 2. Bottom corner section of lead lined door, 300 mm (12 inches) square showing bottom and side edge strips.
- D. Manufacturers' Literature and Data: Each lead radiation shielding item specified.

#### **1.6 WARRANTY**

- A. Warranty lead lined doors against defects in workmanship and materials subject to terms of "Warranty of Construction" Article in GENERAL CONDITIONS, except that warranty period shall be two years.
- B. Warp or twist of lead lined flush veneered doors may not exceed 6 mm (1/4 inch) in any face dimension of door (including full diagonal), measured not less than six months after doors have been hung and finished.

#### **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. Federal Specifications (Fed. Spec.):
  - QQ-L-201F(2).....Lead Sheet
- C. American Society for Testing and Materials (ASTM):

- A167-99(2009).....Stainless and Heat Resisting Chromium-Nickel  
Steel Plate, Sheet and Strip
- C1396/C1396M-04.....Gypsum Wallboard/Gypsum Lath
- C90-11.....Load-Bearing Concrete Masonry Units
- C1002-07.....Steel Drill Screws for the Application of  
Gypsum Board or Metal Plaster Bases
- D1187-97(R2002).....Asphalt-Base Emulsions for Use as Protective  
Coatings for Metal
- D. United States Department of Commerce Product Standard (PS):  
FED PSI 83-84.....Construction and Industrial Plywood
- E. Military Specifications (Mil. Spec.):  
MIL-C-36373.....Cabinet, Cassette Transfer, Wall Mounted
- F. National Council on Radiation Protection and Measurements (NCRP):  
Report 147.....Structural Shielding Design for Medical X-Ray  
Imaging Facilities (2004)
- Report 102.....Medical X-Ray, Electron Beam and Gamma-Ray  
Protection for Energies up to 50 MeV (Equipment  
Design, Performance and Use), (1989)

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Lead Sheet: Fed. Spec. QQ-L-201, Grade C, of thickness shown on drawings.
- D. Lead Lined Gypsum Wallboard:
1. ASTM C1396, Type X, 16 mm (5/8 inch) thick.
  2. Factory bond sheet lead to one side of wallboard.
  3. Apply sheet lead in thicknesses shown, unpierced and in one piece.
- F. Stainless Steel: ASTM A167.
- G. Lead Glass: Clear, X-ray proof, of sufficient thickness to provide X-ray protection equivalent to that provided by partition or door in which glass occurs.
- H. Lead Control Windows: Cast lead, rigid, single unit type without joints, with or without voice passage as shown and with lead stop beads and lead glass.
- K. Fasteners:
1. Cadmium or chromium plated steel screws for securing lead louvers.



2. Standard steel drill screws, ASTM C1002, with lead washers for application of lead lined sheet materials to metal studs and attach washers in accordance with shielding manufacturer's instructions.
3. Nails:
  - a. Use barbed lead head nails for application of lead lined materials to wood furring strips.
  - b. Long enough to penetrate furring strips not less than 25 mm (one inch).
  - c. Cast-lead head sufficiently thick to equal lead shielding of room provided.
- L. Lead Discs: Same thickness as lead lining, diameter 25 mm (1 inch) larger than fastener.

## **2.2 FABRICATION**

- A. General: Lead lining of frames, doors and other items occurring in partitions shall provide an X-ray absorption equivalent to that of partitions in which they occur.
- B. Clearance between Doors and Frames and Floors:
  1. Jambs and Heads: A maximum 3 mm (1/8 inch) clearance.
  2. Bottom of door to finish floor: Maximum 19 mm (3/4 inch) clearance.
- C. Lead Lined Wood Doors:
  1. Flush veneered construction.
  2. Construct doors of two separate solid wood cores with a single sheet of lead lining through center.
  3. Doors shall have filler strips, crossbanding, face veneers and hardwood edge strips, all glued together with unextended urea resin glue applied under heavy pressure.
  4. Extend sheet lead lining to all door edges, providing X-ray absorption equal to partition in which door occurs.
  5. Fasten wood cores together with either countersunk steel bolts through lead with bolt heads and nuts covered with poured lead, or with poured lead dowels.
  6. Bolts or dowels shall be located 38 mm (1-1/2 inches) from door edges, and at not more than 200 mm (eight inches) on center in each direction over door area.
  7. Finish face of dowels and lead covering of bolt heads and nuts flush with wood cores.
  8. Edge strips:
    - a. Same species of wood as face veneer.

- b. Minimum thickness of edge strips shall be 38 mm (1-1/2 inches) at top edge and 63 mm (2-1/2 inches) at bottom edge.
  - c. Glue strips to cores before face veneer is applied.
  - d. Extend vertical edge strips full height of door and bevel 3 mm (1/8 inch) for each 50 mm (two inches) of door thickness.
  - e. Give top and bottom edges of doors to receive transparent finish two coats of water resistant sealer before shipment to site.
9. Face veneer for painted doors shall be rotary cut, good grade, mill choice close grained hardwood, except lauan is not acceptable. Use only one species of wood for face veneer.

- 
- a. Use identical face veneer on both sides of door. Apply face veneer with grain vertical.
  - b. Give doors to be painted a shop prime coat of exterior oil paint on all surfaces before shipment to site.

D. Hardware:

- 1. Hardware for doors is specified in Section 08 71 00, DOOR HARDWARE.
- 2. Stagger bolts to door pulls on plates which penetrate lead lining relative to opposite plate and recess on side of door opposite pull.
- 3. Provide lead plugs or discs over recessed nut ends of such bolts, unless otherwise shown.
- 5. Provide round head screws with dull chromium plated finish to secure stainless steel pans.
- 7. Make recesses for lock and latch cases at mill and line with lead butted tightly to lead in door.
- 8. Make total thickness of sheet lead used for lining hardware, equivalent to thickness of sheet lead core of door.
- 9. Protection and installation of doors and hardware is specified in Section, 08 11 13 / 08 14 00 / 08 71 00, HOLLOW METAL DOORS AND FRAMES / WOOD DOORS / DOOR HARDWARE.

E. Lead Lining of Frames:

- 1. Line or cover steel frames, stops for doors, and corner type control windows with sheet lead.
- 2. Install sheet lead free of waves, lumps and wrinkles with as few joints as possible.
- 3. Make joints in sheet lead to obtain X-ray absorption equivalent to adjacent sheet lead. Finish joints smooth and neat.

4. Structural steel frames and metal door frames for lead lined doors are specified in Section 05 50 00, METAL FABRICATIONS and Section 08 11 13, HOLLOW METAL DOORS AND FRAMES respectively.

### **PART 3 - EXECUTION**

#### **3.1**

#### **3.2 FLOOR LEAD**

#### **3.5 LEAD LINED GYPSUM WALLBOARD PANELS**

- A. Apply lead lined gypsum wallboard to wood furring strips metal studs as shown.
- B. Predrill or drill pilot holes for nails or screws as necessary to prevent deformation of the fastener and lead shielding and to prevent distortion of the wallboard.
- C. Apply wallboard vertically with lead linings placed next to supports.
- D. Install sheet lead strips behind joints not less than the thickness used for the wallboard.
  1. The lead strips: 45 mm (1-3/4 inches) wide, except at corner joints, 45 mm by 45 mm (1-3/4 by 1-3/4 inch) lead angles shall be used.
  2. Secure the lead strips to supports at outer edges of strips.
- E. Wallboard:
  1. Nail to supports with nails or fastened to supports with screws and lead washers or discs at approximately 250 mm (ten inches) on centers.
  2. Make provisions for connection with lead lined door frames and for cutouts for vision panels.
  3. Joint treatment of lead lined gypsum board panels and fastening depressions shall be as specified for wallboard in Section 09 29 00, GYPSUM BOARD.

#### **3.6 SUPPLEMENTAL LEAD SHIELDING**

- A. Line or cover penetrations of wall lead, pipe chases, columns fasteners and elsewhere where shown with sheet lead. Install sheet lead free of waves, lumps and wrinkles and with as few joints as possible. Joints in sheet lead shall provide X-ray absorption equivalent to adjacent sheet lead finished smooth and neat.
- B. Where plaster finish is required over columns or other vertical surfaces covered with sheet lead, drive bolts or other fasteners securing the sheet lead to backing surface half way, and wrap an 18 gage stainless steel tie wire around fasteners. Both ends of each tie

wire shall be of sufficient length so that when fastener is fully driven, fastening of metal lath may be accomplished. Locate fasteners not over 400 mm (16 inches) on centers both ways and cover heads with lead strips or discs if washers are not used.

- C. Provide sufficient lead shielding for spaces around outlet boxes, junction boxes, film illuminators, and pipes, to obtain a net radiation protection at these spaces equaling net radiation protection specified for wall or partition in which they occur.

### 3.7 SIGNS: FURNISH SIGNS AS FOLLOWS:

- A. One for each NEW SURGICAL ROOM/, lettered as follows:  
 THE PARTITIONS, THE DOORS OF THIS ROOM HAVE BEEN INSULATED WITH SHEET LEAD OF 1/16 INCHES THICKNESS PROVIDING A TOTAL LEAD EQUIVALENT PROTECTION OF 1/16".  
 SURFACES OF THIS ROOM HAVE BEEN INSULATED WITH SHEET LEAD OF THE FOLLOWING THICKNESS TO A HEIGHT OF 2100 mm (7 FEET) ABOVE FLOOR SLAB:
- E. Signs:
1. Heavy white paper or cardboard.
  2. Height of lettering and number not less than 3 mm (1/8 inch).
  3. Fill in blank spaces on signs with mm thickness of lead as installed and total mm thickness of lead equivalent (determined by VA Physicist) and height of such insulation where required.
  4. Mount in stainless steel or extruded aluminum frames (with acrylic plastic, 3 mm (1/8 inch) thick over sign) and fasten with suitable screws, one to each corner of each frame.
  5. Provide manufacturer's standard stainless steel frame, to hold card size 100 mm by 150 mm (four by six inches).

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## E. Signs:

1. Heavy white paper or cardboard.
2. Height of lettering and number not less than 3 mm (1/8 inch).
3. Fill in blank spaces on signs with mm thickness of lead as installed and total mm thickness of lead equivalent (determined by VA Physicist) and height of such insulation where required.
4. Mount in stainless steel or extruded aluminum frames (with acrylic plastic, 3 mm (1/8 inch) thick over sign) and fasten with suitable screws, one to each corner of each frame.
5. Provide manufacturer's standard stainless steel frame, to hold card size 100 mm by 150 mm (four by six inches).

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**SECTION 14 24 00**  
**HYDRAULIC ELEVATORS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the engineering, furnishing, and installation of the complete electric hydraulic elevator system as described herein and as indicated on the contract drawings.
- B. Items listed in the singular apply to each and every elevator in this specification except where noted.
- C. Passenger Elevators No. P-12, shall be oil hydraulic type with microprocessor based control, single car selective collective automatic operation and power-operated single-speed center opening car and hoistway doors. Elevators shall have Class "A" loading.

**1.2 RELATED WORK**

- A. Section 01 33 23 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- C. SECTION 09 06 00, SCHEDULE FOR FINISHES: As a master format for construction projects, to identify interior and exterior material finishes for type, texture, patterns, color and placement.
- D. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirements for seismic restraint of non-structural components.
- E. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- F. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.
- G. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- H. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- I. Section 26 05 71, ELECTRICAL SYSTEM PROTECTIVE DEVICE STUDY: Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- J. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.

- K. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- L. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.
- M. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting.
- N. VA Barrier Free Design Handbook (H-18-13)

### 1.3 QUALIFICATIONS

- A. Approval by the Contracting Officer is required for products or services of proposed manufacturers, suppliers and installers and shall be contingent upon submission by Contractor of a certificate stating the following:
  - 1. Elevator contractor is currently and regularly engaged in the installation of elevator equipment as one of his principal products.
  - 2. Elevator contractor shall have three years of successful experience, trained supervisory personnel, and facilities to install elevator equipment specified herein.
  - 3. The installers shall be Certified Elevator Mechanics with technical qualifications of at least five years of successful experience and Apprentices actively pursuing certified mechanic status. Certificates are required for all workers employed in this capacity.
  - 4. Elevator contractor shall submit a list of two or more prior hospital installations where all the elevator equipment he proposes to furnish for this project functioned satisfactorily to serve varying hospital traffic and material handling demands. Provide a list of hospitals that have the equipment in operation for two years preceding the date of this specification. Provide the names and addresses of the Medical Centers and the names and telephone numbers of the Medical Center Administrators.
- B. Approval of Elevator Contractor's equipment will be contingent upon their identifying an elevator maintenance service provider that shall render services within // one hour // two hours // four hours // of receipt of notification, together with certification that the quantity and quality of replacement parts stock is sufficient to warranty continued operation of the elevator installation.
- C. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record for unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and

does not have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.

- D. All hydraulic elevators shall be the product of the same manufacturer.
- E. The Contractor shall provide and install only those types of safety devices that have been subjected to tests witnessed and certified by an independent professional testing laboratory that is not a subsidiary of the firm that manufactures supplies or installs the equipment.
- F. Welding at the project site shall be made by welders and welding operators who have previously qualified by test as prescribed in American Welding Society Publications AWS D1.1 to perform the type of work required. VAMC shall require welding certificates be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and shall be obtained from the COTR of safety department. Request permit one day in advance.

#### 1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date contract is signed.
- B. Federal Specifications (Fed. Spec.):
  - J-C-30B.....Cable and Wire, Electrical (Power, Fixed Installation)
  - W-C-596F.....Connector, Plug, Electrical; Connector, Receptacle, Electrical
  - W-F-406E.....Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
  - HH-I-558C.....Insulation, Blankets, Thermal (Mineral Fiber, Industrial Type)
  - W-F-408E.....Fittings for Conduit, Metal, Rigid (Thick- Wall and Thin-wall (EMT) Type)
  - RR-W-410.....Wire Rope and Strand
  - TT-E-489J.....Enamel, Alkyd, Gloss, Low VOC Content
  - QQ-S-766 .....Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet and Strip
- C. International Building Code (IBC)
- D. American Society of Mechanical Engineers (ASME):
  - A17.1.....Safety Code for Elevators and Escalators



- A17.2.....Inspectors Manual for Electric Elevators and Escalators
- E. National Fire Protection Association:  
 NFPA 13.....Standard for the Installation of Sprinkler Systems  
 NFPA 70.....National Electrical Code (NEC)  
 NFPA 72.....National Fire Alarm and Signaling Code  
 NFPA 101.....Life Safety Code  
 NFPA 252.....Fire Test of Door Assemblies
- F. American Society for Testing and Materials (ASTM):  
 A1008/A1008M-09.....Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability  
 E1042-02.....Acoustically Absorptive Materials Applied by Trowel or Spray
- G. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS):  
 SP-58.....Pipe Hangers and Supports
- H. Society of Automotive Engineers, Inc. (SAE)  
 J517-91.....Hydraulic Hose, Standard
- I. Gages:  
 For Sheet and Plate: U.S. Standard (USS)  
 For Wires: American Wire Gauge (AWG)
- J. American Welding Society (AWS):  
 D1.1.....Structured Welding Code - Steel
- K. National Electrical Manufacturers Association (NEMA):  
 LD-3.....High-Pressure Decorative Laminates
- L. Underwriter's Laboratories (UL):  
 486A.....Safety Wire Connectors for Copper Conductors  
 797.....Safety Electrical Metallic Tubing
- M. Institute of Electrical and Electronic Engineers (IEEE)
- N. Regulatory Standards:  
 Uniform Federal Accessibility Standards  
 Americans with Disabilities Act

#### 1.5 SUBMITTALS

- A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Before execution of work, furnish information to evidence full compliance with contract requirements for proposed items. Such

information shall include, as required: Manufacturer's Name, Trade Names, Model or Catalog Number, Nameplate Data (size, capacity, and rating) and corresponding specification reference (Federal or project specification number and paragraph). All submitted drawings and related elevator material shall be forwarded to the Contracting Officer.

C. Shop Drawings:

1. Complete scaled and dimensioned layout in plan and section view showing the arrangement of equipment and all details of each and every elevator unit specified including:
  - a. Complete layout showing location of storage tank/pump assembly, controller, piping layout, outside diameter of cylinder/plunger assembly, size of car platform, car frame members, and support assembly.
  - b. Car, guide rails, brackets, buffers, and other components located in hoistway.
  - c. Rail bracket spacing and maximum vertical forces on guide rails in accordance with ASME A17.1 Section 2.23 and Section 8.4.8 for Seismic Risk Zone 2 or greater.
  - d. Reactions at points of supports and buffer impact loads.
  - e. Weights of principal parts.
  - f. Top and bottom clearances and over travel of the car.
  - g. Location of shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the machine room.
2. Drawings of hoistway entrances and doors showing details of construction and method of fastening to the structural members of the building.
  - a. If drywall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
  - b. Sill details including sill support.

D. Samples:

1. One each of stainless steel, 75 mm x 125 mm (3 in. x 5 in.).
2. One each of baked enamel, 75 mm x 125 mm (3 in. x 5 in.).
3. One each of color vinyl floor tile.
4. One each of protection pads, 75 mm x 125 mm (3 in. x 5 in.) if used.
5. One each car and hoistway Braille plate sample.
6. One each car and hall button sample.
7. One each car and hall lantern/position indicator sample.

8. One each wall and ceiling material finish sample.
  9. One each car lighting sample.
  10. No other samples of materials specified shall be submitted unless specifically requested after submission of manufacturer's name. If additional samples are furnished pursuant to request, adjustment in contract price and time will be made as provided in Section 00 72 00, GENERAL CONDITIONS.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the elevator layouts:
1. Storage tank/pump assembly.
  2. Pump and motor, HP and RPM rating, Voltage, Starting and Full Load Ampere, Number of phases, and Gallons per minute.
  3. Controller
  4. Starters and Overload Current Protection Devices.
  5. Car Safety Device; Rupture Valve and Manual Shut Off Valves.
  6. Electric Door Operator; HP rating and RPM of motor.
  7. Hoistway Door Interlocks.
  8. Car Buffers; maximum and minimum rated load, maximum rated striking speed and stroke.
  9. Cab Ventilation Unit; HP rating and CFM rating.
- F. Complete construction drawings of elevator car enclosure, showing dimensioned details of construction, fastenings to platform, car lighting, ventilation, ceiling framing, top exits, and location of car equipment.
- G. Complete dimensioned detail of vibration isolating foundations for storage tank/pump assembly.
- H. Dimensioned drawings showing details of:
1. All signal and operating fixtures.
  2. Car slide guides/roller guides.
  3. Hoistway door tracks, hangers, and sills.
  4. Door operator, infrared curtain units.
- I. Cuts or drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

#### **1.6 WIRING DIAGRAMS**

- A. Provide three complete sets of field wiring and straight line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer

and mounted in the elevator machine room as directed by the Resident Engineer.

- B. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the Resident Engineer within 30 days of final acceptance.
- C. Provide the following information relating to the specific type of microprocessor controls installed:
  - 1. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.
  - 2. System logic description.
  - 3. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.
  - 4. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

#### **1.7 ADDITIONAL EQUIPMENT**

- A. Additional equipment required to operate the specified equipment manufactured and supplied for this installation shall be furnished and installed by the contractor. The cost of the equipment shall be included in the base bid.
- B. Special equipment not required by specification, which would improve the operation, may be installed in conjunction with the specified equipment by the contractor at his option at no additional cost to the Government, provided prior approval is obtained from the Contracting Officer's Technical Representative.

#### **1.8 TOOL CABINET**

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet size shall be 1220 mm (48 in.) high, 762 mm (30 in.) wide, and 457 mm (18 in.) deep.

#### **1.9 PERFORMANCE STANDARDS**

- A. The elevators shall be capable of meeting the highest standards of the industry and specifically the following:

1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load conditions, regardless of direction of travel, shall not vary more than five (5) percent.
  2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per second and the maximum acceleration and retardation shall not exceed 0.2G per second.
  3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. The door operator shall open the car door and hoistway door simultaneously at 2.5-feet per second and close at 1-foot per second.
- C. Pressure: Fluid system components shall be designed and factory tested for 500 psi operating pressure.
- D. Floor level stopping accuracy shall be within 3 mm (1/8 in.) above or below the floor, regardless of load condition.
- E. Noise and Vibration Isolation: All elevator equipment including their supports and fastenings to the building, shall be mechanically and electrically isolated from the building structure to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.
- F. Sound Isolation: Noise level relating to elevator equipment operation in machine room shall not exceed 80 dBA. All dBA readings shall be taken three (3) feet off the floor and three (3) feet from equipment.
- G. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 dBA in elevator lobbies and 60 dBA inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.

#### **1.10 WARRANTY**

- A. Submit all labor and materials furnished in connection with elevator system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The one year Warranty shall commence after final inspection, completion of performance test, and upon full acceptance of the installation and shall concur with the guarantee period of service.
- B. During warranty period if a device is not functioning properly or in accordance with specification requirements, or if in the opinion of the Contracting Officer's Technical Representative, excessive maintenance and attention must be employed to keep device operational, device shall

be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation of installation is obtained. Period of warranty shall start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Where stainless steel is specified, it shall be corrosion resisting steel complying with Fed. Spec. QQ-S-766, Class 302 or 304, Condition A with Number 4 finish on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension and surfaces shall be smooth and without waves. During installation all stainless steel surfaces shall be protected with a suitable material.
- B. Where cold rolled steel is specified, it shall be low-carbon steel rolled to stretcher leveled standard flatness, complying with ASTM A109.

### **2.2 MANUFACTURED PRODUCTS**

- A. Materials, devices and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items. Items not meeting this requirement, but meet technical specifications which can be established through reliable test reports or physical examination of representative samples, will be considered.
- B. When two or more devices of the same class of materials or equipment are required, these units shall be products of one manufacturer.
- C. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled unit.
  - 1. Individual components of assembled units shall be products of the same manufacturers.
  - 2. Parts which are alike shall be the product of a single manufacturer.
  - 3. Components shall be compatible with each other and with the total assembly for the intended service.
- D. Motor nameplates shall state manufacturers' name, rated horsepower, speed, volts, amperes and other characteristics required by NEMA Standards and shall be securely attached to the item of equipment in a conspicuous location.
- E. The elevator equipment, including controllers, door operators, and supervisory system shall be non-proprietary, the product of

manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.

- F. Where key operated switches are furnished in conjunction with any component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each and every key shall have a tag bearing a stamped or etched legend identifying its purpose. Barrel key switches are not acceptable, except where required by code.
- G. If the elevator equipment to be installed is not known to the Resident Engineer, the Contractor shall submit drawings in triplicate for approval to the Resident Engineer, Contracting Officer, and VA CFM Elevator Engineer showing all details and demonstrate that the equipment to be installed is in strict accordance with the specifications.

### 2.3 CAPACITY, SIZE, SPEED, AND TRAVEL

- A. Each direct-plunger elevator shall have the capacity to lift the live load, including the weight of entire car and plunger, at the speed specified in the following schedule:

ELEVATOR SCHEDULE	
Elevator Number	
Overall Platform Size	
Rated Load - kg(lb)	
Contract Speed - m/s(fpm)	
Total Travel - m/s(fpm)	
Number of Stops	
Number of Openings	
Entrance Type & Size	
Plunger Size	

**2.4 POWER SUPPLY**

- A. For power supply in each machine room see Specification 260521, ELECTRICAL SPECIFICATION and Electrical drawings.
- B. It shall be the electrical contractor's responsibility to supply the labor and materials for the installation of the following:
  - 1. Feeders from the power source indicated on the drawings to each elevator controller.
  - 2. Shunt Trip Circuit Breaker for each controller shall be located inside machine room at the strike side of the machine room door and lockable in the "Off" position.
  - 3. Provide Surge Suppressors to protect the elevator equipment.
- C. Power for auxiliary operation of elevator as specified shall be available from auxiliary power generator, including wiring connection to the elevator control system.

**2.5 CONDUIT AND WIREWAY**

- A. Unless otherwise specified or approved, install electrical conductors, except traveling cable connections to the car, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than 3/4 inch or electrical metallic tubing smaller than 1/2 inch electrical trade size shall not be used. All raceways completely embedded in concrete slabs, walls, or floor fill shall be rigid steel conduit. Wireway (duct) shall be used in the hoistway and to the controller and between similar apparatus in the elevator machine room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than 3/8 inch electrical trade size may be used, not exceeding 18 inches in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.
- B. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or boxes by terminal fittings having an insulated opening for the conductors.



- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used. All fittings shall be steel or malleable iron.
- D. Connect motors or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

## **2.6 CONDUCTORS**

- A. Unless otherwise specified, conductors, excluding the traveling cables, shall be stranded or solid coated annealed copper in accordance with Federal Specification J-C-30B for Type RHW or THW. Where 16 and 18 AWG are permitted by NEC, single conductors or multiple conductor cables in accordance with Federal Specification J-C-580 for Type TF may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. Multiple conductor cable shall have color or number coding for each conductor. Conductors for control boards shall be in accordance with NEC. Joints or splices are not permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements.
- B. Provide all necessary conduit and wiring between machine room and hoistway.
- C. All wiring must test free from short circuits or ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.
- D. Where size of conductors is not given, voltage and amperes shall not exceed limits prescribed by NEC.
- E. Provide equipment grounding. Ground the conduits, supports, controller enclosure, motor, platform and car frame, and all other non-current conducting metal enclosures for electrical equipment in accordance with NEC. The ground wires shall be copper, green insulated and sized as required by NEC. Bond the grounding wires to all junction boxes, cabinets, and wire raceways.
- F. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Federal Specification W-S-610. The Elevator Contractor may, at his option, make these terminal connections on 10 gauge or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an

approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.

## **2.7 TRAVELING CABLES**

- A. All conductors to the car shall consist of flexible traveling cables conforming to the requirements of NEC. Traveling cables shall run from the junction box on the car directly to the controller. Junction boxes on the car shall be equipped with terminal blocks. Terminal blocks having pressure wire connectors of the clamp type that meet UL 486A requirements for stranded wire may be used in lieu of terminal eyelet connections. Terminal blocks shall have permanent indelible identifying numbers for each connection. Cables shall be securely anchored to avoid strain on individual terminal connections. Flame and moisture resistant outer covering must remain intact between junction boxes. Abrupt bending, twisting and distortion of the cables shall not be permitted.
- B. Provide spare conductors equal to 10 percent of the total number of conductors furnished, but not less than 5 spare conductors in each traveling cable.
- C. Provide shielded wires for the auto dial telephone system within the traveling cable. Add 5 pair shielded wires for card reader, 2 RG-6/U coaxial CCTV cables, and 2 pair 14 gauge wires for CCTV power as needed.
- D. If traveling cables come into contact with the hoistway or elevator due to sway or change in position, provide shields or pads to the elevator and hoistway to prevent damage to the traveling cables.
- E. Hardware cloth wide may be installed from the hoistway suspension point downward to the elevator pit to prevent traveling cables from rubbing or chafing. Hardware cloth shall be securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flat wall.

## **2.8 CONTROLLER AND SUPERVISORY PANEL**

- A. UL/CSA Labeled Controller: Mount all assemblies, power supplies, chassis switches, and relays on a self-supporting steel frame. Completely enclose the equipment and provide a mean to control the temperature. Solid state components shall be designed to operate between 32 to 104 degrees Fahrenheit, humidity non-condensing up to 85 percent.
- B. All controller switches and relays shall have contacts of design and material to insure maximum conductivity, long life and reliable

operation without overheating or excessive wear, and shall provide a wiping action to prevent sticking due to fusion. Switches carrying highly inductive currents shall be provided with arc shields or suppressors.

- C. Where time delay relays are used in the circuits, they shall be of acceptable design, adjustable, reliable, and consistent such as condenser timing or electronic timing circuits.
- D. Properly identify each device on all panels by name, letter, or standard symbol which shall be neatly stencil painted or decaled in an indelible and legible manner. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere rating shall be marked adjacent to all fuse holders. All spare conductors to controller and supervisory panel shall be neatly formed, laced, and identified.

## **2.9 MICROPROCESSOR CONTROL SYSTEM**

- A. Provide a microprocessor based system with absolute position/speed feedback encoded tape and electronic motor starter to control the pump motor and signal functions in accordance with these specifications. Across the line and wye-delta starters are not acceptable. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval.
  - 1. All controllers shall be non-proprietary.
  - 2. Proprietary tools shall not be necessary for adjusting, maintenance, repair, and testing of equipment.
  - 3. Controller manufacturer shall provide factory training, engineering and technical support, including all manuals and wiring diagrams to the VA Medical Center's designated Elevator Maintenance Service Provider.
  - 4. Replacement parts shall be shipped overnight within 48 hours of an order being received.
- B. All controller assemblies shall provide smooth, step-less acceleration and deceleration of the elevator, automatically and irrespective of the load in the car. All control equipment shall be enclosed in a metal cabinet with lockable, hinged door(s) and shall be provided with a means of ventilation. All non-conducting metal parts in the machine room shall be grounded in accordance with NEC. Cabinet shall be securely attached to the building structure.

- C. Circuit boards for the control of each and every elevator system; dispatching, signals, door operation and special operation shall be installed in a NEMA Type 1 General Purpose Enclosure. Circuit boards shall be moisture resistant, non-corrosive, non-conductive, fabricated of non-combustible material and adequate thickness to support the components mounted thereon. Mounting racks shall be spaced to prevent accidental contact between individual circuit boards and modules.
- D. Modules shall be of the type that plug into pre-wired mounting racks. Field wiring or alteration shall not be necessary in order to replace defective modules.
- E. Each device, module and fuse (with volt and ampere rating) shall be identified by name, letter or standard symbol in an approved indelible and legible manner on the device or panel. Coordinate identification markings with identical markings on wiring diagrams.
- F. The electrical connections between the printed circuit boards (modules) and the circuit connectors incorporated in the mounting racks shall be made through individual tabs which shall be an integral part of each module. The tabs shall be nickel-gold plated or other approved metal of equal electrical characteristics. Modules shall be keyed or notched to prevent insertion of the modules in the inverted position.
- G. Light emitting diodes (LED) shall be for visual monitoring of individual modules.
- H. Components shall have interlocking circuits to assure fail-safe operation and to prevent elevator movement should a component malfunction.
- I. Method of wire wrapping from point to point with connections on the mounting racks shall be submitted for approval.
- J. Field wiring changes required during construction shall be made only to the mounting rack connection points and not to the individual module circuitry or components. If it is necessary to alter individual modules they shall be returned to the factory where design changes shall be made and module design records changed so correct replacement units will be available.
- K. All logic symbols and circuitry designations shall be in accordance with ASME and NEC Standards.
- L. Solid state components shall be designed to operate within a temperature range of 32 to 104 degrees Fahrenheit, humidity non-condensing up to 85 percent.

- M. Wiring connections for operating circuits and for external control circuits shall be brought to terminal blocks mounted in an accessible location within the controller cabinet. Terminal blocks using pierce through serrated washers shall not be used.

#### **2.10A AUXILIARY POWER OPERATION**

- A. The control system for Elevators P 12 shall provide for the operation of at least one car per elevator bank on auxiliary power upon failure of the normal power supply.
- B. Auxiliary power supply, its starting means, transfer switch for transfer of elevator supply from normal to auxiliary power, two pair of conductors in a conduit from an auxiliary contact on the transfer switch (open or close contacts as required by Controller Manufacturer) to terminals in the group elevator controller and other related work shall be provided by the Electrical Contractor.
- C. Auxiliary equipment on elevator controllers, wiring between associated elevator controllers and wiring between elevator controllers and remote selector panel as required to permit the elevators to operate as detailed, shall be provided by the Elevator Contractor.
- D. Upon loss of normal power supply there shall be a delay before transferring to auxiliary power of 10 seconds minimum to 45 seconds maximum, the delay shall be accomplished through an adjustable timing device. Following this adjustable delay the associated elevators shall function as follows:
- E. Prior to the return of normal power an adjustable timed circuit shall be activated that will cause all cars to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of power from auxiliary power to normal building power shall take place after all cars are stopped at a floor with their doors open.
- F. Car lighting circuits shall be connected to the auxiliary power panel.

#### **2.10B EMERGENCY RESCUE OPERATION**

- A. Provide a power source to send the elevator to the lowest landing by activating the down valves. After the elevator has leveled at the lowest landing, provide power to open the car and hoistway doors automatically. After a predetermined time the car and hoistway doors shall close. Power shall stay applied to the door open button so the doors can be opened from the inside of the elevator. The elevator shall remain shut down at the bottom landing until normal power is restored.

Install a sign on the controller indicating that the power is applied to the down valve and door operator during loss of normal power.

**2.11B SINGLE CAR SELECTIVE COLLECTIVE AUTOMATIC OPERATION**

- A. Provide single car selective collective automatic operation for elevators P12,
- B. Operate car without attendant from push buttons inside the car and located at each floor adjacent to the elevator entrance. When car is available, automatically start car and dispatch it to the floor corresponding to registered car or hall call. Once car starts, it shall respond to registered calls in direction of travel in the order floors are reached. Do not reverse car directions until all car calls have been answered or until all hall calls ahead of car and corresponding to direction of car travel have been answered. Slow car and stop automatically at floors corresponding to registered calls, in the order in which they are approached in either direction of travel. As slowdown is initiated, automatically cancel the hall call and car call. Hold car at arrival floor an adjustable time interval to allow passenger transfer. Illuminate appropriate push button to indicate call registration. Extinguish light when call is answered.
- C. When all calls in the system have been satisfied, the elevator shall shut down at the last landing served with the car and hoistway doors closed. Registration of a call at the landing where the car is parked shall automatically open the car and hoistway doors. Provide a predetermined time delay to permit passengers entering the parked car to register the call of their choice and establish direction of travel before the system can respond to landing calls registered to the same time above or below the parked car.
- D. Auxiliary Landing Call Operation: In the event of corridor call button circuit failure, elevators are to service each floor in both directions in a predetermined pattern without registration of a call within the elevator. Provide an illuminated signal in the controller to indicate that emergency dispatch operation is in effect. Restoration of the landing call button system shall cause normal operation to resume.
- E. Car lights and fan in the elevator shall not shut off when elevator is idle. Arrange circuits so that power to lights and outlets on top and bottom of car shall not be interrupted.

**2.12 FIREFIGHTERS' SERVICE**

- A. Provide Firefighters' Service as per ASME A17.1 Section 2.27.

**B. Smoke Detectors:**

1. Smoke detection devices that are designated for actuation of Elevator Phase I "FIRE SERVICE" response in each elevator lobby, top of hoistway, and machine room shall be provided by others.
  - a. Elevator lobby smoke detectors shall activate only the elevators sharing the corresponding or common lobby.
  - b. Top of hoistway smoke detectors shall activate fire recall and the top of hoistway motorized vent.
  - c. Elevator or group of elevators serving separate isolated areas of the same floor shall have an independent smoke detection system.
  - d. Machine room smoke detectors shall activate fire recall for each and every elevator with equipment located in that machine room.
  - e. Hoistway ventilation, provided by others, located at the top of hoistway for elevators that penetrate more than three floors and meets the requirements of ASME A17.1 Section 2.1.4 and IBC Section 3004. The vent shall stay closed under power. When the top of hoistway smoke detector is activated, the power is removed from the vent and the vent shall open. When the smoke detector is reset, the vent shall close by power.

**2.14 SEISMIC REQUIREMENTS**

- A. Meet the requirements of ASME A17.1 Section 8.4, Elevator Safety Requirements for Seismic Risk Zone 2 or greater and VA Seismic Design Manual H-18-8.
- B. Support and maintain pump unit, controller, rails, rail brackets, conduit, buffers, piping, scavenger pumps and jack unit assembly in place as to effectively prevent any part from sliding, rotating or overturning or jumping under conditions imposed by seismic forces not less than that required to produce an acceleration of gravity horizontally and 1/2 gravity vertically acting simultaneously. Design the total system to continue operation without interruption under specified seismic acceleration, as outlined in H-18-8.
- C. Support all vertical conduits and duct systems within the hoistway at points above the center of gravity of riser. Provide lateral guides at regular intervals.
- D. Provide hydraulic equipment mounted on vibration isolators with seismic restraints.

- E. Bolt pump unit and controller to the floor and provide sway braces at top. Secure all electrical components within the panels to the panel frame. Fit doors and hinged panels with positive locking latches.
- F. Car guide rail brackets and rail clip bolts shall be guarded against snagging on the side of the rail adjacent to the point of suspension of the traveling cables.
- G. Provide car guide rails with at least one intermediate bracket between brackets located at each floor so that bracket spacing does not exceed 2400 mm (8 ft). If intermediate brackets cannot be installed because of lack of structural support, reinforce rails with 225 mm (9 in.) channel or approved equal backing.
- H. Guide rails shall not be less than 22.5 kg/m (15 lb/ft).
- I. The stresses in parts of structural members made of steel shall not exceed 88 percent of the minimum elastic strength of the material used in the fastenings.
- J. Provide car enclosure ceiling panels and fluorescent tubes with latching devices that shall restrain the panels and fluorescent tubes. Devices shall be readily removable for cleaning or replacing panels and re-lamping.
- K. Submittals are required for all equipment anchors, supports, restraints and detectors. Submittals shall include weight, dimensions, center of gravity, standard connections, calculations, manufacturer's recommendations, behavior problems (vibration, thermal, expansion, etc.,) so that design can be properly reviewed.
- L. California only: provide an Earthquake Detection device in machine room to activate "GO SLOW ELEVATORS" operation. The following are references:
  - 1. Emergency Service:
    - a. Earthquake emergency operation Section 304(d)
    - b. Title 8, Industrial Relations, Division 01
    - c. Department of Industrial Relations, Chapter 4
    - d. Division of Industrial Safety, Sub Chapter 6, Elevator Safety Order

#### **2.15 PUMP UNIT ASSEMBLY**

- A. Completely integrate the pump unit for the control of the elevator and self-contain in a unit fabricated of structural steel. The unit shall consist of a hydraulic fluid pump driven by an induction motor together with oil control valves, piping, etc. Enclose unit on four open sides



of the power unit frame with not less than 16 gauge steel removable panel sections. Provide a minimum 50 mm (2 in.) air space between the top of the panels and bottom of tank. Line panels on the interior side with one-inch rigid acoustical insulation board.

- B. Control valves shall be electronically controlled. Hydraulic fluid flow shall be controlled to insure speed variation of not more than five (5) percent under all load conditions.
- C. Hydraulic system working pressure shall not exceed 500 psi under any load condition.
- D. Pump shall be positive displacement, rotary screw type, specifically designed for hydraulic elevator service, having a steady discharge without pulsation to give smooth and quiet operation. Pump output shall be capable of lifting elevator car with rated capacity, with a speed variation of no more than five (5) percent between no load and full load. Pump shall operate under flooded suction in an accurately machined case with the clearance required to assure maximum efficiency. Hydraulic fluid by-pass shall discharge directly into storage tank.
- E. Motor shall be squirrel-cage, drip proof, ball bearing, and induction type, with a synchronous speed not in excess of 1800 RPM. Design motor specifically for elevator service, not to exceed nameplate full load current by more than 10% and be continuously rated 120 starts per hour without exceeding a rise of 40 degrees C. Include closed transition SCR soft start.
- F. Connect motor and pump with multiple V-belt. Size belts and sheaves for duty involved and design to prevent any metallic contact between motor and pump shaft. Provide isolation units of rubber in shear to prevent transmission of pump and motor vibration to the building. Install expanded metal sheave guard that can be easily removed for servicing and inspection.
- G. Hydraulic equipment may be installed within the oil storage tank if applicable for elevator size, speed, and duty rating.
- H. Design motor, pump, tank, and piping to accommodate future travel, if specified.

#### **2.16 HYDRAULIC SYSTEM**

- A. Construct the storage tank of sheet steel, welded construction, and a steel cover with suitable means for filling, a minimum one-inch protected vent opening, an overflow connection, and a valve drain connection. Tank shall act as a storage tank only, and sized to pass

through machine room door as shown on drawings. Provide marked gauge to monitor hydraulic fluid level. Tank shall be of capacity to hold volume of hydraulic fluid required to lift elevator to top terminal landing, plus a reserve of not less than ten gallons. Provide a baffle in the bottom of the tank to prevent entry of any sediment or foreign particles into hydraulic system. Baffle shall also minimize aeration of hydraulic fluid. Permissible minimum hydraulic fluid level shall be clearly indicated. Hydraulic fluid shall be of good grade to assure free flow when cool, and have minimum flash point of 400 degrees F. Provide initial supply of hydraulic fluid for operation of elevator.

1. Thermostatically control the viscosity of the hydraulic fluid with // thermal cooling unit // chilled water heat exchanger // and temperature thermostat to maintain the fluid temperature in the reservoir, pump and valves at a constant operating viscosity.
  2. Provide a data plate on the tank framing indicating the characteristics of the hydraulic fluid used.
- B. Furnish and install connections between the storage tank, pump, muffler, operating valves, and cylinder complete with necessary valves, pipe supports, and fittings. All connections between the discharge side of the pump, check valve, muffler, cylinder, lowering valves shall be of schedule 40 steel with threaded, flanged, or welded mechanical couplings. Size of pipe and couplings between cylinder and pumping unit shall be such that fluid pressure loss is limited to 10 percent.
- C. Do not subject valves, piping, and fittings to working pressure greater than those recommended by the manufacturer.
- D. Support all horizontal piping. Place hangers or supports within 305 mm (12 in.) on each side of every change of direction of pipe line and space supports not over 3.0 meters (10 ft) apart. Secure vertical runs properly with iron clamps at sufficiently close intervals to carry weight of pipe and contents. Provide supports under pipe to floor.
1. Provide all piping from machine room to hoistway, including necessary supports or hangers. If remote piping is underground or in damp inaccessible areas, install hydraulic piping thru PVC sleeve pipe.
- E. Install pipe sleeves where pipes pass through walls or floors. Set sleeves during construction. After installation of piping, equip the sleeves with snug fitting inner liner of either glass or mineral wool insulation.

- F. Install blowout-proof, non-hammering, oil-hydraulic muffler in the hydraulic fluid supply pressure line near power unit in machine room. Design muffler to reduce to a minimum any pulsation or noises that may be transmitted through the hydraulic fluid into the hoistway.
- G. Arrange control valves to operate so hydraulic fluid flow will be controlled in positive and gradual manner to insure smooth starting and stopping of elevator.
- H. Provide safety check valve between cylinder and pump connection which will hold elevator with specified load at any point when pump stops or pressure drops below minimum operating levels.
- I. Provide an automatic shut-off valve in the oil supply line at the cylinder inlet. Weld pipe protruding from cylinder at inlet and thread to receive shut-off valve. Activate the automatic shut-off valve when there is more than a ten percent increase in high speed in the down direction. When activated, this device shall immediately stop the descent of the elevator, and hold the elevator until it is lowered by use of the manual lowering feature of the valve. Arrange the manual lowering feature of the automatic shut-off valve to limit the maximum descending speed of the elevator to 15 fpm. The exposed adjustments of the automatic shut-off valve shall have their means of adjustment sealed after being set to their correct position.
- J. Provide external tank shut-off valve to isolate hydraulic fluid during maintenance operations.
- K. Provide all pump relief and other auxiliary valves to comply with the requirements of the ASME A17.1 Section 3.19 and to insure smooth, safe, and satisfactory operation of elevator.
- L. Furnish and adjust by-pass and relief valve in accordance with ASME A17.1 Rule 3.19.4.2.
- M. Install check valve to hold the elevator car with rated load at any point when the pump stops.
- N. Provide shut-off valves in the pit near the cylinder and in the machine room capable of withstanding 150 percent of design operating pressure. Each manual valve shall have an attached handle.
- O. Conveniently locate the manual lowering valve, easily accessible, and properly identified with a red arrow and not concealed within the storage tank. Mark the operating handle in red.
- P. Provide a low oil control feature which shall shut off the motor and pump and return the elevator to the lowest landing. Upon reaching the

lowest landing, doors will open automatically allowing passengers to leave the car. Then doors shall close. All control buttons, except the door open button, shall be made ineffective.

- Q. Provide oil-tight drip pan for assembled pumping unit, including storage tank. Pan shall be not less than 16 gauge sheet steel, with one-inch sides.
- R. The entire hydraulic system, including muffler, shall be tested to withstand a pressure equal to twice the calculated working pressure. Submit certification that test has been performed.

#### **2.17 HYDRAULIC PLUNGER ASSEMBLY**

- A. Design cylinder and plunger in accordance with ASME A17.1. It shall be of sufficient size to lift gross load the height specified // including future travel.// Factory test at a pressure equal to twice the calculated working pressure, for strength and to insure freedom from leakage. Provide bottom of cylinder head with internal guide bearing and top of cylinder head with removable packing gland. Packing gland shall permit ready replacement of packing. Victaulic type packing gland head will not be permitted.
  - 1. Provide a bleeder valve located below the cylinder flange to release air or other gases from the system.
  - 2. Equip cylinder with drip ring below the packing gland to collect leakage of hydraulic fluid.
  - 3. Bolt the cylinder mounting brackets to continuous footing channels that also support the rails and buffers.
- B. Install a flexible tubing scavenger line with an electrically operated pump between the piston drip ring and oil storage tank. Scavenger line, pump and strainers shall operate independently of hydraulic fluid pressure. Equip scavenger pump with a water float designed to prevent operation of the pump should the pit flood and designed to be manually reset. Strap the pump and reservoir to the pit channels.
- C. Plunger shall be heavy seamless steel tubing, turned smooth and true to within plus or minus .38 mm (0.015 in.) tolerance and no diameter change greater than .07 mm (0.003in.) per-inch of length. Grind the plunger surface to a fine polish finish, 12 micro-inches or finer. Where plunger is multi-piece construction, machine the joints to assure perfectly matching surfaces. No tool marks shall be visible.
  - 1. Secure plunger to underside of platform supporting beams with fastenings capable of supporting four times the weight of the

- plunger. The platen plate shall incorporate piston car vibration isolator as herein specified.
2. Provide a stop ring welded or screwed to the bottom of plunger that shall prevent the plunger from leaving its cylinder. //For plunger units that include future travel, locate the stop ring to permit only the actual travel and required runby//.
  3. Isolate plunger head from the platen plate to prevent corrosion or electrolysis.
  4. Carefully protect plunger and replace if gouged, nicked or scored.
  5. If conditions beneath the pit floor are not adequate to support the total loading of the elevator, install reinforcing members in the pit floor.
- D. Before installation, clean entire cylinder wall of all traces of oil, grease, moisture, dirt and scale.

#### **2.18 HYDRAULIC CYLINDER CASING**

- A. The casing shall be iron or steel not less than 0.375-inch thick, at least 15.2 mm (6 in.) larger in diameter than the cylinder. The Elevator Contractor shall demonstrate to the Resident Engineer that the casing has been accurately set, positioned, and plumbed to accept the plunger assembly. Close the bottom with a minimum of 15.2 mm (6 in.) of concrete.
- B. Provide PVC casing liner to fit inside steel casing. Fabricate from schedule 80 PVC pipe with watertight bottom and a top flange gasket to seal plunger flange and form a complete, watertight, electrically non-conductive encasement of the entire unit.
- C. Provide suitable well hole to accommodate casing. Coordinate the drilling of well hole and setting of the cylinder with construction of concrete pit. Provide watertight joint between the casing and the pit floor at bottom of pit.
- D. Base bid on drilling hole in dirt, sand, rock, gravel, loam, boulders, hardpan, water, or other obstacles. Include the removal of all dirt and debris.

#### **2.19 CAR BUFFERS**

- A. Provide a minimum of two spring buffers for each elevator that meet the requirements of ASME A17.1 Section 3.22. Securely fasten buffers and supports to the pit channels and in the alignment with striker plates on elevator. Ever installed buffer shall have a permanently attached

metal plate indicating its stroke and load rating. Buffer anchorage shall not puncture pit waterproofing.

- B. Design and install buffers to provide minimum car runby required by ASME A17.1 Rule 3.4.2.
- C. Furnish pipe stanchions and struts as required to properly support the buffer.

## **2.20 CAR GUIDES**

- A. Install on car frame four // flexible sliding swivel guide shoes // adjustable roller guides //, each assembled on a substantial metal base, to permit individual self-alignment to the guide rails.
- B. Guide Shoes:
  1. Provide each shoe with renewable non-metallic gibs of durable material having low coefficient of friction and long-wearing qualities, when operated on guide rails receiving infrequent, light applications of rail lubricant. Gibs containing graphite or other solid lubricants are not acceptable.
  2. Flexible guide shoes of approved design, other than swivel type, may be used provided they are self-aligning on all three faces of the guide rails.
  3. Provide spring take-up in car guide shoes for side play between rails.
- D. Equip car with an auxiliary guiding device for each guide shoe which shall prevent the car from leaving the rails in the event that the normal guides are fractured. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. Fabricate the auxiliary guides from hot rolled steel plate and mount between the normal guide shoes and the car frames. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide which shall come in contact with the rail guiding surfaces in the event of loss of the normal guides shall be lined with an approved bearing material to minimize damage to the rail guiding surfaces.

## **2.21 GUIDE RAILS, SUPPORTS, AND FASTENINGS**

- A. Guide rails shall conform to ASME A17.1 Section 2.23.
- B. Guide rails for car shall be planed steel T-sections and weigh 27.5 kg/m (18.5 lb/ft) C. Securely fasten guide rails to the brackets or other supports by heavy duty steel rail clips.

- D. Provide necessary car rail brackets of sufficient size and design to secure substantial rigidity to prevent spreading or distortion of rails under any condition.
  - 1. Slotted or oversized holes shall be fitted with flat washers and shall conform to ASME A17.1 Rule 2.23.10.3.
  - 2. Where fastenings are over 4.2 m (14 ft) apart, rails shall be reinforced with 228 mm (9 in.) channel or approved equal backing to secure the rigidity required.
- E. Rail joints and fishplates shall be in accordance with ASME A17.1 Rule 2.23.7. Rail joints shall not interfere with clamps and brackets. Design rail alignment shims to remain in place if fastenings become loose.
- F. Guide rails shall extend from channels on pit floor to within 76 mm (3 in.) of the underside of the concrete slab or grating at top of hoistway with a maximum deviation of 3.2 mm (1/8 in.) from plumb in all directions. Provide a minimum of 19 mm (3/4 in.) clearance between bottom of rails and top of pit channels.
- G. Guide rail anchorages in pit shall be made in a manner that will not reduce effectiveness of the pit waterproofing.
- H. In the event inserts or bond blocks are required for the attachment of guide rails, the Contractor shall furnish such inserts or bond blocks and shall install them in the forms before the concrete is poured. Use inserts or bond blocks only in concrete or block work where steel framing is not available for support of guide rails. Expansion-type bolting for guide rail brackets will not be permitted.
- I. Guide rails shall be clean and free of any signs of rust, grease, or abrasion before final inspection. Paint the shank and base of the T-section with two field coats of manufacturer's standard enamel.

## **2.22 NORMAL AND FINAL TERMINAL STOPPING DEVICES**

- A. Normal and final terminal stopping devices shall conform to ASME A17.1 Section 2.25.
- B. Mount terminal slowdown switches and direction limit switches on the elevator or in hoistway to reduce speed and bring car to an automatic stop at the terminal landings.
  - 1. Switches shall function with any load up to and including 100 percent of rated elevator capacity at any speed obtained in normal operation.

- 2. Switches, when opened, shall permit operation of elevator in reverse direction of travel.
- C. Mount final terminal stopping switches in the hoistway.
  - 1. Switches shall be positively opened should the car travel beyond the terminal direction limit switches.
  - 2. Switches shall be independent of other stopping devices.
  - 3. Switches, when opened, shall remove power from pump motor and control valves preventing operation of car in either direction.
- D. After final stopping switches have been adjusted, through bolt switches to guide rail.

#### **2.23 CROSSHEAD DATA PLATE AND CODE DATA PLATE**

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead. Data plate shall bear information required by ASME A17.1 Section 2.16.3 and 2.20.2.1.
- B. Permanently attach a Code Data Plate, in plain view, to the controller, ASME A17.1 Section 8.9.

#### **2.24 WORKMAN'S LIGHTS AND OUTLETS**

- A. Provide duplex GFCI protected type receptacles and lamp, with guards on top of elevator car and beneath platform.
- B. The receptacles shall be in accordance with Fed. Spec. W-C-596 for Type D7, 2-pole, 3-wire grounded type rated for 15 amperes and 125 volts.

#### **2.25 TOP-OF-CAR OPERATING DEVICE**

- A. Provide a cartop operating device that meets the requirements of ASME A17.1 Section 2.26.
- B. The device shall be activated by a toggle switch mounted in the device. The switch shall be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (1/4 in.) letters.
- C. Movement of the elevator shall be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop toggle type switch.
- E. Provide permanent identification for the operation of all components in the device.
- F. The device shall be permanently attached to the elevator crosshead on the side of the elevator nearest to the hoistway doors used for accessing the top of the car.



**2.26 CAR LEVELING DEVICE**

- A. Car shall be equipped with a two-way leveling device to automatically bring the car to within 3 mm (1/8 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction.
- B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (1/8 in.) of level with the floor landing regardless of the load carried.
- C. Provide encoded steel tape, steel tape with magnets or steel vanes with magnetic switches. Submit design for approval.

**2.27 EMERGENCY STOP SWITCHES**

- A. Provide an emergency stop switch for each top-of-car device, pit, machine spaces, service panel and firefighters' control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1220 mm (48 in.) above the bottom landing sill and 1220 mm (48 in.) above the pit floor adjacent to the pit ladder.
- B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

**2.28 MAIN CAR OPERATING PANEL**

- A. Locate the main car operating panel in the car enclosure on the front return panel for passenger/service elevators and the front of the side wall for freight elevators. The top floor car call push button shall not be more than 1220 mm (48 in.) above the finished floor. Car call push buttons and indicator lights shall be round with a minimum diameter of 25 mm (1 in.), LED white light illuminated.
- B. One piece front faceplate, with edges beveled 15 degrees, shall have the firefighters' service panel recessed into the upper section and the service operation panel recessed into the lower section, fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with cylinder type key operated locks. Secure the faceplate with stainless steel tamperproof screws.
- C. All terminology on the main car operating panel shall be raised or engraved. Use 6 mm (1/4 in.) letters to identify all devices in upper section of the main car operating panel. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm

(1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.

- D. The upper section shall contain the following items in order listed from top to bottom:
1. Engrave elevator number, 25 mm (1 in.) high with black paint for contrast.
  2. Engrave capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.
  3. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system shall automatically provide emergency light in the car upon failure or interruption of the normal car lighting service, and function irrespective of the position of the light control switch in the car. The system shall be capable of maintaining a minimum illumination of 1.0 foot-candle when measured 1220 mm (48 in.) above the car floor and approximately 305 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.
  4. LED illuminated digital car position indicator with direction arrows. Digital display floor numbers and direction arrows shall be a minimum of 50mm (2 in.) high.
  5. Firefighters' Emergency Operation Panel shall conform to the requirements of ASME A17.1 Section 2.27. Firefighters' Panel shall be 1676 mm (66 in.) minimum to 1830 mm (72 in.) maximum to the top of the panel above finished floor.
  6. Firefighters' Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).
  7. Medical Emergency switch marked "MEDICAL EMERGENCY" with two positions labeled "ON" and "OFF" and Medical Emergency Indicator Light located next to the key switch shall be round with a minimum diameter of 25 mm (1 in.). Instruction for Medical Emergency operation shall be engraved below the key switch and light.
  8. Independent Service switch, see Section 2.30 for detailed description.
  9. Provide a Door Hold button on the faceplate next to the independent service key switch. It shall have "DOOR HOLD" indelibly marked on the button. Button shall light when activated. When activated, the door shall stay open for a maximum of one minute. To override door

hold timer, push a car call button or door close button. Door Hold button is not ADA required and Braille is not needed.

10. Complete set of round car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12mm (1/2 in.) high in the face of the call button. Stack buttons in a single vertical column for low rise buildings up to six floors with front openings only.
  11. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb as required by ADA.  
ton.//
  12. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 890 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices as required by A17.1 Rule 2.27.1.2. Provide audible signaling devices including the necessary wiring.
  13. Emergency Help push button shall activate two way communications by Auto Dial telephone system as required by ASME A17.1 Rule 2.27.1.1.3. Help button shall be LED white light illuminated and flash when call is acknowledged. Legibly and indelibly label the button "HELP" in the face of the button with 12 mm (1/2 in.) high letters.
  14. Provide a corresponding Braille plate on the left side of each button. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm (1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.
- E. The service operation panel, in the lower section shall contain the following items:
1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".

2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled "INSPECTION" with its two positions marked "ON" and "OFF".
3. Three position switch labeled "FAN" with its positions marked "HIGH", "LOW" and "OFF" for controlling car ventilating blower.
4. Two position, spring return, toggle switch or push button to test the emergency light and alarm device. It shall be labeled "TEST EMERGENCY LIGHT AND ALARM".

### **2.30 INDEPENDENT SERVICE**

- A. Provide a legibly and indelibly labeled "INDEPENDENT SERVICE", two-position key operated switch on the face of the main car operating panel that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.

### **2.31 CAR POSITION INDICATOR**

- A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 50 mm (2 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

### **2.32 AUDIO VOICE SYSTEM**

- A. Provide digitized audio voice system activated by stopping at a floor. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loud speaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice announcer units shall be

the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.

1. Fire Service Message
2. Medical Emergency Service Message
3. "Please do not block doors."
4. Provide special messages as directed by Resident Engineer.

### **2.33 AUTO DIAL TELEPHONE SYSTEM**

- A. Furnish and install a complete ADA compliant intercommunication system.
- B. Provide a two-way communication device in the car with automatic dialing, tracking and recall features with shielded wiring to car controller in machine room. Provide dialer with automatic rollover capability with minimum two numbers.
- C. "HELP" button shall illuminate and flash when call is acknowledged. Button shall match floor push button design.
- D. Provide "HELP" button tactile symbol engraved signage and Braille adjacent to button mounted integral with car operating panels.
- E. The auto dial system shall be located in the auxiliary car operating panel. The speaker and unit shall be mounted on the backside of the perforated stainless steel plate cover.
- F. Each elevator shall have an individual phone number.
- G. If the operator ends the call, the phone shall be able to redial immediately.

### **2.34 CORRIDOR OPERATING DEVICE FACEPLATES**

- A. Fabricate faceplates for elevator operating and signal devices from not less than 3 mm (1/8 in.) thick flat stainless steel with all edges beveled 15 degrees. Install all faceplates flush with surface on which they are mounted.
- B. Corridor push button faceplates shall be at least 127 mm (5 in.) wide by 305 mm (12 in.) high. The centerline of the landing push buttons shall be 1067 mm (42 in.) above the corridor floor.
- C. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.
- D. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.
- E. Design corridor push button faceplates so that pressure on push buttons shall be independent of pressure on push button contacts.

- F. Engraved legends in faceplates shall have lettering 6 mm (1/4 in.) high filled with black paint.
- G. Provide a corresponding Braille plate on the left side of each button. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm (1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.

### **2.35 CORRIDOR OPERATING DEVICES**

- A. Provide one risers of landing call buttons located as shown on contract drawings.
- B. Fixtures for intermediate landings shall contain "UP" and "DOWN" buttons. Fixtures for terminal landings shall contain a single "UP" or "DOWN" button.
- C. Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- D. The direction of each button shall be legibly and indelibly identified by arrows not less than 12 mm (1/2 in.) high in the face of each button.
- E. Two or more risers of landing call buttons, if specified, shall be cross-connected so that either "UP" or "DOWN" buttons at a floor shall be capable of registering a call to that floor for the entire elevator group. Registration of a landing call shall illuminate "UP" or "DOWN" buttons simultaneously, and upon satisfaction of that call, both buttons shall be extinguished simultaneously.
- F. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.

### **2.36 CORRIDOR LANTERN/POSITION INDICATOR**

- A. Provide each car with combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each and every floor. Provide each terminal landing with "UP" or "DOWN", minimum 64 mm (2 1/2 in.) high digital arrow lanterns and each intermediate landing with "UP" and "DOWN" digital arrow lanterns. Each lens shall be LED illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to

indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal in advance of car arrival at the landing indicating the direction of travel whether or not corridor button has been operated at that floor. Hall calls shall receive immediate assignment to individual cars and hall lantern shall sound and illuminate. Corridor lanterns shall not be illuminated when a car passes a floor without stopping. Each lantern shall be equipped with a clearly audible electronic chime which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal. Car riding lanterns are not acceptable.

- B. Provide alpha-numeric digital position indicators directly over hoistway landing entranceways between the arrival lanterns at each and every floor. Indicator faceplate shall be stainless steel. Numerals shall be not less than 50 mm (2 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping. The appropriate direction arrow shall be illuminated during entire travel of car in corresponding direction.
- C. Provide LED illumination in each compartment to indicate the position and direction the car is traveling by illuminating the proper alpha-numeric symbol. When the car is standing at a landing without direction established, arrows shall not be illuminated.

### **2.37 HOISTWAY ACCESS SWITCHES**

- A. Provide hoistway access switches for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. Elevators with center opening doors, mount the access key switch 1830 mm (6 ft) above the corridor floor next to the hoistway entrance jamb. Exposed portions of each access switch or its faceplate shall have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions. Submit design and location of access switches for approval. Each access switch shall be a constant pressure cylinder type lock having not less than five pins or five stainless steel disc combination with key removable only when switch is in the "OFF" position. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose in the VA Medical Center. When the car is moved down from the top terminal

landing, limit the zone of travel to a distance not greater than the top of the crosshead level with the top floor.

- B. Provide emergency access for all hoistway entrances, keyways for passenger and service elevators and locked door release system (key access) for freight elevators.

#### **2.38 HOISTWAY ENTRANCES: PASSENGER/SERVICE ELEVATORS**

- A. Provide entrances of metal construction using cold rolled steel. Door frames shall be constructed of stainless steel. Complete entrances with sills, hanger supports, hangers, tracks, angle struts, unit frames, door panels, fascia plates, toe guards, hardware, bumpers, sight guards, and wall anchors.
- B. Provide one piece extruded stainless steel sills with non-slip wearing surface, grooved for door guides and recessed for fascia plates. Sills shall have overall height of not less than 19 mm (3/4 in.) set true, straight, and level, with hoistway edges plumb over each other, and top surfaces flush with finished floor. Grout the sills full length after installation.
- C. Construct hanger supports of not less than 4.5 mm (3/16 in.) thick steel plate, and bolted to strut angles.
- D. Structural steel angles 127 mm x 127 mm x 13 mm (5 in. x 5 in. x 1/2 in.) shall extend from top of sill to bottom of floor beam above, and shall be securely fastened at maximum 457 mm (18 in.) on center and at each end with two bolts.
- E. Provide jambs and head soffits, of not less than 14-gauge stainless steel, for entrances. Jambs and head soffits shall be bolted or welded construction, and provided with three anchors each side. Side jambs shall be curved type. Radius of curvature shall be 89 mm (3 1/2 in.). Head jamb shall be square type, and shall overhang corridor face of side jambs by 6 mm (1/4 in.). Rigidly fasten jambs and head soffits to building structure. Provide jambs with protective covering. After installation, protect jambs and head soffits to prevent damage to finish during construction. Solidly grout jambs.
- F. Provide 14-gauge sheet steel fascia plates in hoistway to extend vertically from head of hanger support housing to sill above. Plates shall be the same width as the door opening of elevator and adequately reinforced to prevent waves and buckles. Below bottom terminal landing and over upper terminal landing provide shear guards beveled back to



and fastened to the wall. // Where rear openings are used, provide shear guards and fascia plates as required by ASME A17.1. //

- G. Provide hoistway entrance with flush center opening hoistway doors for Elevators P12/. Door panels shall be not less than 16-gauge stainless steel, flush type construction, and not less than 32 mm (1 1/4 in.) thick. Wrap stainless steel around the leading and trailing edges of the door panel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. At bottom of each and every panel, provide two removable laminated phenolic gibs or other approved material guides and a separate fire gib. Reinforce each door panel for hangers, interlock mechanism, drive assembly, and closer. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or in lieu of this, labels from other accredited test laboratories may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COTR. Fasten sight guard of 14-gauge stainless steel, extending full height of panel, to leading edge of each panel of center opening doors.
- H. Provide hangers for hoistway door panels and provide relating devices to transmit motion from one door panel to the other. Fasten the hangers to the door sections. Provide reinforcements at the point of attachment. The hanger shall have provisions for vertical and lateral adjustments. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with rubber or non-metallic sound-reducing tires mounted on malleable iron or steel brackets. The hanger sheaves shall operate at a relatively low rotational speed, and shall roll on a high-carbon, cold-rolled or drawn steel track shaped to permit free movement of sheaves without regard to vertical adjustment of sheave, bracket or housing. Beneath the track and each hanger sheave, provide a hardened steel up-thrust roller capable of withstanding a vertical thrust equal to the carrying capacity of adjacent upper sheave. The up-thrust shall have fine vertical adjustments, and the face of the roller shaped so as to permit free movement of the hanger sheave. The up-thrust roller shall have ball or roller bearings. Provide the hanger sheaves with steel fire stops to prevent disengagement from tracks.

- I. Do not use hangers that are constructed integrally with the door panels.
- J. Provide raised numerals on cast, rear mounted plates for all openings. Numerals shall be a minimum of 50 mm (2 in.) high, located on each side of entrance frame, with centerline of 1524 mm (5 ft) above the landing sill. The number plates shall contain Braille.
- K. Provide unique car number on every elevator entrance at designated main fire service floor level, minimum 76 mm (3 in.) in height.

#### **2.39 ELECTRIC INTERLOCKS**

- A. Equip each hoistway door with an interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position. Hoistway door interlocks shall not be accepted unless they meet the requirements of ASME A17.1 Section 2.12.
- B. Equip car doors with electric contact that prevents operation of car until doors are closed unless car is operating in leveling zone or hoistway access switch is used. Locate door contact to prevent its being tampered with from inside of car. Car door contact shall not be accepted unless it meets the requirements of ASME A17.1 Section 2.12.
- C. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2, or equivalent.
  - 1. Type SF-2 cable terminations in the interlock housing shall be sleeved with glass braid fillers or equivalent.
- D. Provide devices, either mechanical or electrical, that shall prevent operation of the elevator in event of damaged or defective door equipment that has permitted an independent car or hoistway door panel to remain in the "unclosed" and "unlocked" position.

#### **2.40 CAR FRAME: PASSENGER/SERVICE ELEVATORS**

- A. Car frame shall conform to the requirements of ASME A17.1 Section 2.15, constructed of steel plates and structural shapes securely riveted, bolted, or welded together. Iron casting shall not be permitted. The entire assembly shall be rugged construction, and amply braced to withstand unequal loading of platform. Car frame members shall be constructed to relieve the car enclosure of all strains. Balance car front to back and side to side. Provide balancing weights and frames, properly located, to achieve the required true balance.
- B. Provide a bonding wire between frame and plunger.

**2.41 CAR PLATFORM: PASSENGER/SERVICE ELEVATORS**

- A. Construct the car platform to comply with all the requirements of ASME A17.1 Section 2.15.5. The platform shall be designed to withstand the forces developed under the loading conditions specified. Provide car entrances with extruded nickel silver sill or better with machined or extruded guide grooves. Cover underside and all exposed edges of wood filled platform with sheet metal of not less than 27-gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable. Platform shall have flexible composition flooring not less than 3 mm (1/8 in.) thick. For color, see Section 09 06 00, SCHEDULE FOR FINISHES. Adhesive material shall be type recommended by manufacturer of flooring. Lay flooring flush with threshold plate and base.
- B. Provide a platform guard (toe guard) that meets the requirements of ASME A17.1 Section 2.15.9, of not less than 12-gauge sheet-steel on the entrance side, extend 76 mm (3 in.) beyond each side of entrance jamb. Securely brace platform guard to car platform, and bevel bottom edge at a 60-75 degree angle from horizontal. Install platform in the hoistway, so that the clearance between front edge and landing threshold shall not exceed 32 mm (1 1/4 in.).
- C. Isolate the platform from the car frame by approved rubber pads or other equally effective means.
- D. Provide adjustable diagonal brace rods to hold platform firmly within car suspension frame.
- E. Provide a bonding wire between frame and platform.

**2.42 CAR ENCLOSURE: PASSENGER/SERVICE ELEVATORS**

- A. Car enclosure shall have a dome height inside the cab of 2440 mm (8 ft).
- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 457 mm (18 in.) running through an angle at the base of panels to underside of platform. Provide 6 mm (1/4 in.) bolts with nuts and lock washers.
- C. Car enclosure base shall be of 14-gauge stainless steel, 152 mm (6 in.) high. Provide straight type base at front return sides. Vertical face of base at sides and rear shall be flush with, or recessed behind the wainscot directly above the base. There shall be no exposed fastenings in base. Provide natural ventilation openings divided equally between

the bottom and top of the car enclosure that shall provide a minimum 3.5 percent of the inside car floor area.

- D. Construct canopy of not less than 12-gauge steel.
- E. Car top railings shall meet the requirements of ASME A17.1 Rules 2.14.1.7 and 2.10.2.
- F. Front return wall panel, entrance columns, rear corner columns, entrance head-jamb and transom shall be 14-gauge stainless steel full height of car. Side and rear walls from top of base to top of panel shall be constructed of 14-gauge cold rolled steel. Side and rear walls up to 1220 mm (48 in.) above finished floor shall be covered with stainless steel. Side and rear walls from 1220 (48 in.) to the ceiling shall be covered with // high pressure plastic laminate // stainless steel //. Apply directly to the cab walls or to 13 mm (1/2 in.) plywood/particle board that meets requirements of ASTM E 84, UL 723, or CAN/ULC-S102.2, whichever is applicable. Submit a method of fastening plywood/particle board to steel walls. It shall be flush with the face of the bottom section of the stainless steel. Plastic laminate shall comply with Federal Specification L-P-508, Style Type 1, and Class 1. Color is specified in Section 09 06 00, SCHEDULE FOR FINISHES, Interior shall be flush panel construction with angles welded on exterior to insure adequate rigidity. Coat exterior of panels with mastic sound insulation material approximately 2.5 mm (3/32 in.) thick followed by a prime coat of paint. Mastic material shall conform to ASTM E1042.
  - 1. Smooth and flush all joints with no ragged or broken edges. Plastic laminate shall comply with NEMA LD-3, textured finish, general purpose type, grade designation GP 50, and 0.050 in. thickness, except with a minimum wear resistance of 1200 cycles, and backer sheet, grade designation BK 20, and 0.020 in. thickness.
- G. Provide a hinged top emergency exit cover. Exit shall be unobstructed when open and shall have mechanical stops on the cover. Provide a code approved exit switch to prevent operation of the elevator when the emergency exit is open.
- H. Provide duplex, GFCI protected type receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 150 mm (6 in.) above the car floor.
- I. Lighting for passenger elevators:

1. Provide stainless steel hanging ceiling frame. Construct frame of 1/8 in. x 1 1/2 in. x 1 1/2 in. "T" and "L" sections, divide ceiling into six panels.
  2. Provide fluorescent or LED illuminated car light fixtures above the ceiling panels. See Specification 265100, Interior Lighting for fixture and ballast type. Maintain a minimum light level of 50-foot candles at 914 mm (36 in.) above the finished floor.
- J. Lighting for service elevators:
1. Provide car lighting with indirect fluorescent or LED lamps mounted in lighting coves along each side of the cab ceiling, front to back. See Specification 265100, Interior Lighting for fixture and ballast type. Maintain a minimum light level of 50-foot candles at 914 mm (36 in.) above the finished floor.
  2. Equip the lighting cove with asymmetrical reflectors having specular ALZAK (or equal) finish. Maintain a minimum light level of 50-foot candles 914 mm (36 in.) above finished floor at the car operating panels.
  3. Enclose the entire vertical space between the light trough outer edge and the cab canopy with approved opaque white or clear lumicite sheeting. Install the lumicite sheeting so that it is removable for cleaning and re-lamping.
- K. Provide a blower unit arranged to exhaust through an opening in the canopy. Provide a stainless or chrome plated fan grill around the opening. Provide 2-speed fan, capable of rated free delivery air displacement of approximately 380 and 700 cfm at respective speeds. Mount fan on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide screening over intake and exhaust end of blower. Provide a 3-position switch to control the unit in service panel.
- L. Provide car enclosure with two sets of stainless steel handrails.
1. 75 mm (3 in.) wide x 9 mm (3/8 in.) thick flatstock located with centerlines 750 mm and 1050 mm (30 in. and 42 in.) above the car floor.
  2. Locate handrails approximately 38 mm (1 1/2 in.) from cab wall. Install handrails on two side and rear walls Curve ends of handrails to walls. Conceal all handrail fastenings. Handrails shall be removable from inside the car enclosure.

- M. Provide car entrance with single speed center opening horizontal sliding car doors, of same type as hoistway doors for Elevators P12. Construct door panels to be flush hollow metal construction, not less than 32 mm (1 1/4 in.) thick, consisting of one continuous piece 16-gauge stainless steel on car side face, leading and trailing edges. Separate two plates by a sound-deadening material, and reinforce by steel shapes welded to the plates at frequent intervals. Reinforce panels as required for installation of hangers, power-operating and door-opening devices. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with rubber or non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Upthrust rollers shall be capable of being locked in position after adjustment to a maximum of .38 mm (1/64 in.) clearance. Provide two laminated phenolic gibs on each door panel. Gibs shall be replaceable without removal of door panel. Provide door drive assembly, restrictor, gate switch, header, track, arms, and all related door hardware.

**2.43 POWER DOOR OPERATORS: PASSENGER/SERVICE ELEVATORS**

- A. Provide a high-speed heavy duty door operator to automatically open the car and hoistway doors simultaneously when the car is level with the floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to the motor. The door operator shall be capable of opening a car door and hoistway door simultaneously, at a speed of .762 m (2.5 ft) per second. The closing speed of the doors shall be .3 m (1 ft) per second. A reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 38 mm (1.5 in.) maximum of door movement. Emphasis is placed on obtaining quiet interlock and door operation; smooth, fast, dynamic braking for door reversals, stopping of the door reversal, and stopping of the doors at extremes of travel. Construct all levers and drive arms operating the doors, of heavy steel members, and all pivot points shall have ball or roller bearings. Auxiliary automatic door closers required under ASME A17.1 Section

2.11.3 shall be torsion spring type B. Design the door operator so that in case of interruption or failure of the electric power from any cause, it shall permit emergency manual operation of the car door and hoistway door from within the car, only in the door zone. Out of door zone, doors are restricted to 100 mm (4 in.) opening.

1. It shall not be possible for the doors to open by power unless the elevator is within the leveling zone.
  2. Provide infrared curtain unit. The device shall cause the car and hoistway doors to reverse automatically to the fully-open position should the unit be actuated while the doors are closing. Unit shall function at all times when the doors are not closed, irrespective of all other operating features. The leading edge of the unit shall have an approved black finish.
- C. Should the doors be prevented from closing for more than a predetermined adjustable interval of 20 to 60 seconds by operation of the curtain unit, the doors shall stay open, the audio voice message and a buzzer located on the car shall sound only on automatic operation. **Do not provide door nudging.**
1. If an obstruction of the doors should not activate the photo-electric door control device and prevent the doors from closing for more than a predetermined adjustable interval of 15 to 30 seconds, the doors shall reverse to the fully open position and remain open until the "Door Close" button re-establishes the closing cycle.
- D. Provide door "OPEN" and "CLOSE" buttons. When the door "OPEN" button is pressed and held, the doors, if in the open position, shall remain open and if the doors are closing, they shall stop, reverse and re-open. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Examine work of other trades on which the work of this Section depends. Report defects to the Resident Engineer in writing which may affect the work of this trade or equipment operation dimensions from site for preparation of shop drawings.
- B. Ensure that shafts and openings for moving equipment are plumb, level and in line, and that pit is to proper depth, waterproofed and drained with necessary access doors, ladder and guard.

- C. Ensure that machine room is properly illuminated, heated and ventilated, and equipment, foundations, beams correctly located complete with floor and access stairs and door.
- D. Before fabrication, take necessary job site measurements, and verify where work is governed by other trades. Check measurement of space for equipment, and means of access for installation and operation. Obtain dimensions from site for preparation of shop drawings.
- E. Ensure the following preparatory work, provided under other sections of the specification has been provided. If the Elevator Contractor requires changes in size or location of trolley beams, or their supports, trap doors, etc., to accomplish their work, he must make arrangements, subject to approval of the Contracting officer and include cost in their bid. Where applicable, locate controller near and visible to its respective hydraulic pump unit. Work required prior to the completion of the elevator installation:
  - 1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.
  - 2. Provide light and GFCI outlets in the elevator pit and machine room.
  - 3. Furnish electric power for testing and adjusting elevator equipment.
  - 4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
  - 5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.
  - 6. Machine room enclosed and protected from moisture, with self closing, self locking door and access stairs.
  - 7. Provide fire extinguisher in machine room.
- F. Supply for installation, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.

### **3.2 SPACE CONDITIONS**

- A. Attention is called to overhead clearance, pit clearances, overall space in machine room, and construction conditions at building site in connection with elevator work. Addition or revision of space requirements, or construction changes that may be required for the complete installation of the elevators must be arranged for and obtained by the Contractor, subject to approval by Resident Engineer. Include cost of changes in bid that become a part of the contract. Provide proper, code legal installation of equipment, including all



construction, accessories and devices in connecting with elevator, mechanical and electrical work specified.

- B. Where concrete beams, floor slabs or other building construction protrude more than 50 mm (2 in.) into hoistway; bevel all top surfaces of projections to an angle of 75 degrees with the horizontal.

### **3.3 INSTALLATION**

- A. Perform work with competent Certified Elevator Mechanics and Apprentices skilled in this work and under the direct supervision of the Elevator Contractor's experienced foreman.
- B. Set hoistway entrances in alignment with car openings, and true with plumb sill lines.
- C. Erect hoistway sills, headers and frames prior to erection of rough walls and doors. Erect fascias and toe guards after rough walls are finished.
- D. Install machinery, guides, controls, car and all equipment and accessories in accordance with manufacturer's instructions, applicable codes and standards.
- E. Isolate and dampen machine vibration with properly sized sound-reducing anti-vibration pads.
- F. Grout sills and hoistway entrance frames.

### **3.4 ARRANGEMENT OF EQUIPMENT**

- A. Clearance around elevator, mechanical and electrical equipment shall comply with applicable provisions of NEC. Arrange equipment in machine room so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment in the same machine room. Locate controller near and visible to its respective hydraulic pump unit.

### **3.5 WORKMANSHIP AND PROTECTION**

- A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.
- C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original condition.

- D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At final completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.
- F. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact in accordance with ASME A17.1 Section 2.10.

### **3.6 CLEANING**

- A. Clean machine room and equipment.
- B. Perform hoistway clean down.
- C. Prior to final acceptance, remove protective covering from finished or ornamental surfaces. Clean and polish surfaces with regard to type of material.

### **3.7 PAINTING AND FINISHING**

- A. Hydraulic pump assembly shall be factory painted with manufacturer's standard finish and color.
- B. Controllers, car frames and platforms, beams, rails and buffers, except their machined surfaces, cams, brackets and all other uncoated ferrous metal items shall be painted one factory priming coat or approved equal.
- C. Upon completion of installation and prior to final inspection, all equipment shall be thoroughly cleaned of grease, oil, cement, plaster and other debris. All equipment, except that otherwise specified as to architectural finish, shall then be given two coats of paint of approved color, conforming to manufacturer's standard.
- D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascias or walls within door restrictor areas as required by ASME A17.1 Rule 2.29.2. The color of paint used shall contrast with the color of the surfaces to which it is applied.
- E. Elevator pump units, controllers, main line shunt trip circuit breakers, bolster channels, and cross heads of cars shall be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals shall contrast with surrounding color and shall be stenciled or decaled.
- F. Hoistway Entrances of Passenger, and Service Elevators:

1. Door panels shall be parkerized or given equivalent rust resistant treatment and a factory finish of one coat of baked-on primer and one factory finish coat of baked-on enamel.
2. Fascia plates, top and bottom shear guards, dust covers, hanger covers, and other metalwork, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given one approved prime coat in the shop, and one field coat of paint of approved color.

G. Hoistway Entrances of Freight Elevators:

1. Metal surfaces of doors and frames shall receive shop prime coat.
2. Finish painting, after installation, shall be one coat of paint of approved color. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.

H. Elevator Cabs for Passenger and Service Elevators:

1. Interior and exterior steel surfaces shall be parkerized or given equivalent rust resistant treatment before finish is applied.
2. Interior steel surfaces shall be factory finished with one coat of baked on enamel or proxylin lacquer. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.
3. Give exterior faces of car doors one finish coat of paint of medium gray color.

I. Elevator Cabs for Freight Elevators:

1. Give interior of cab one prime coat and a minimum of one coat of enamel. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.
2. Give exterior of cab one prime coat and one finish coat of an approved paint.
3. All surfaces of doorframes, door panels, and cab interior surfaces that become damaged or marred shall be restored to original condition before final acceptance of work.

### 3.8 PRE-TESTS AND TESTS

- A. Pre-test the elevators and related equipment in the presence of the Resident Engineer or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by Resident Engineer.
1. Procedure outlined in the Inspectors Manual for Hydraulic Elevators, ASME A17.2 shall apply.

- a. Final test shall be conducted in the presence of and witnessed by an ASME QEI-1 Certified Elevator Inspector.
  - b. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each elevator.
2. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked test weights, oil pressure gauge, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stop watch, and a means of two-way communication.
  3. If during the inspection process the Inspector determines the need, the following instruments shall be available within a four-hour period: Megohm meter, vibration meter, sound meter, and a light meter.
- B. Inspection of workmanship, equipment furnished, and installation for compliance with specification.
  - C. Full-Load Run Test: Elevators shall be tested for a period of one hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at all floors, in either direction of travel, for not less than five or more than ten seconds per floor.
  - D. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed shall be determined by certified tachometer. The actual measured speed of the elevator with all loads in either direction shall be within five (5) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
  - E. Temperature Rise Test: The temperature rise of the pump motor shall be determined during the full load test run. Temperatures shall be measured by the use of thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within 5 degrees Centigrade of the ambient temperature. Other tests for heat runs on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.
  - F. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car in both directions of travel. Accuracy of floor

level shall be within plus or minus 3 mm (1/8 in.) of level with any landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3 mm (1/8 in.) of level with the landing floor regardless of change in load.

- G. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.
- H. Safety Devices Tests: Safety devices shall be tested as required by ASME A17.1 Section 8.10.
- I. Overload Devices: Test all overload current protection devices in the system at final inspection.
- J. Limit Stops:
  - 1. The position of the car when stopped by each of the normal limit stops with no load and with contract load in the car shall be accurately measured.
  - 2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.
- K. Working Pressure: Verify working pressure of the hydraulic system by pressure gauge placed in the system line. Take readings with no load and full load in car.
- L. Test automatic shut-off valve for proper operation.
- M. Setting of Car Door Contacts: The position of the car door at which the elevator may be started shall be measured. The distance from full closure shall not exceed that required by ASME A17.1. The test shall be made with the hoistway doors closed or the hoistway door contact inoperative.
- N. Setting of Interlocks: The position of the hoistway door at which the elevator may be started shall be measured and shall not exceed ASME A17.1 requirements.
- O. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic

floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.

- P. Performance of the Elevator supervisory system shall be witnessed and approved by the representative of the Resident Engineer.
- Q. Evidence of malfunction in any tested system or parts of equipment that occurs during the testing shall be corrected, repaired, or replaced at no additional cost to the Government, and the test repeated.
- R. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the representative of the Resident Engineer.

### **3.9 INSTRUCTION OF VA PERSONNEL**

- A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight hour work day. Instruction shall commence after completion of all work and at the time and place directed by the Resident Engineer.
- B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the Resident Engineer in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list with descriptive literature, and identification and diagrammatic cuts of equipment and parts. Information shall also include electrical operation characteristics of all circuits, relays, timers, and electronic devices, as well as R.P.M. values and related characteristics for all rotating equipment.
- C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

### **3.10 INSPECTIONS AND SERVICE: GUARANTEE PERIOD OF SERVICE**

- A. Furnish complete inspection and maintenance service on entire elevator installation for a period of one (1) year after completion and acceptance of all the elevators in this specification by the Resident

Engineer. This maintenance service shall run concurrently with the warranty. Maintenance work shall be performed by Certified Elevator Mechanic and Apprentices employed and supervised by the company that is providing guaranteed period of service on the elevator equipment specified herein.

- B. This contract will cover full maintenance including emergency call back service, inspections and servicing the elevators listed in the schedule of elevator. The Elevator Contractor shall be required to perform the following:
1. Bi-weekly systematic examination of equipment.
  2. During each maintenance visit the Elevator Contractor shall clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in first class condition and proper working order.
  3. Furnishing all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be only those products recommended by the manufacturer of the equipment.
  4. As required, motors, controllers, selectors, leveling devices, operating devices, switches on cars and in hoistways, hoistway doors and car doors or gate operating device, interlock contacts, guide shoes, guide rails, car door sills, hangers for doors, car doors or gates, and signal system shall be cleaned, lubricated and adjusted.
  5. Guide rails and bottom of platforms shall be cleaned every three months. Car tops and machine room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning of the entire installation including all machine room equipment and hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
  6. Maintain the performance standards set forth in this specification.
  7. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
  8. Maintain smooth starting and stopping and accurate leveling at all times.
- C. Maintenance service shall not include the performance of work required as a result of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.

- D. Provide 24 hour emergency call-back service that shall consist of promptly responding to calls within two hours for emergency service should a shutdown or emergency develop between regular examinations. Overtime emergency call-back service shall be limited to minor adjustments and repairs required to protect the immediate safety of the equipment and persons in and about the elevator.
- E. Service and emergency personnel shall report to the Resident Engineer or his authorized representative upon arrival at the hospital and again upon completion of the required work. A copy of the work ticket containing a complete description of the work performed shall be given to the Resident Engineer.
- F. The Elevator Contractor shall maintain a log book in the machine room. The log shall list the date and time of all bi-weekly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary correction performed or parts replaced.
- G. Written "Maintenance Control Program" shall be in place to maintain the equipment in compliance with ASME A17.1 Section 8.6.

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