

**Department of Veterans Affairs  
VA Contract # VA245-P-0617**

**Relocate Dementia Unit  
Martinsburg, West Virginia**

**Project No. 613-107**

**VOLUME 1 OF 2 – DIVISIONS 0 THROUGH 14**



**Bid Documents  
September 20, 2013**

**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 Relocate Dementia Unit for Polytrauma project located at the Martinsburg, VAMC 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 the C.C. Hodgson Architectural Group, 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 her duly authorized representative.
- D. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.
- E. Prior to commencing work, general contractor shall provide proof that a OSHA 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.
- F. Training:
  - 1. All employees of general contractor or subcontractors shall have the 10-hour and all supervisors, foremen and superintendents of the general contractor or subcontractors shall have the 30-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by VA CP with input from the ICRA team.
  - 2. Submit training records of all such employees for approval before the start of work.
- G. Commissioning:

Contractor is to provide information in the Bid Statement regarding the inclusion of commissioning.

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

### **A. ITEM No. 1 (Base Bid):**

Furnish all labor, tools, materials, equipment, and supervision to construct a new 26,952 SF Dementia household building and new 5,542 SF Connecting Link. All work will be located at the VA Medical Center, 510 Butler Avenue, Martinsburg, WV 25405 and will be performed in accordance with drawings and specifications. Work includes but is not limited to, asbestos abatement, general construction, alterations, demolition, masonry, insulation, drywall, metal stud walls, windows, doors, flooring, painting, telecommunications, utility systems, plumbing, mechanical, electrical, roofing and landscaping work.

**Total Calendar Days for Item No. 1 (Base Bid): 625**

### **B. Bid Item # 2 (Bid Alternate #1):**

Furnish all labor, tools, materials, equipment, and supervision in Item #1, but delete labor, tools, materials, equipment and supervision for the Loading Dock, Asphalt Paving and Asphalt Repairs at the Loading Dock, Toilet and Bath Accessories, Medication Cabinets, Kitchen Equipment, Signage and Lockers. Delete Masonry Veneer and install Exterior Insulation Finishing System.

**Total Calendar Days for Item No. 1 (Base Bid #1): 600**

### **C. Bid Item # 3 (Bid Alternate #2):**

Furnish all labor, tools, materials, equipment, and supervision in Item #1, but delete labor, tools, materials, equipment and supervision for the Healing Garden, Landscape Edging, Temporary Construction Access Road, Concrete Sidewalks, Concrete Pavers, Tube Station, Loading Dock, Asphalt Paving and Asphalt Repairs at the Loading Dock, Toilet and Bath Accessories, Medication Cabinets, Kitchen Equipment, Signage and Lockers. Delete Masonry Veneer and install Exterior Insulation Finishing System.

**Total Calendar Days for Item No. 3 (Bid Alternate #2): 575**

### **D. Bid Item # 4 (Bid Alternate #3):**

Furnish all labor, tools, materials, equipment, and supervision in Item #1, but delete labor, tools, materials, equipment and supervision to delete installation of Dual Connecting Corridor and install Single Width Connecting Corridor, delete the Healing Garden, Landscape Edging, Temporary Construction Access Road, Concrete Sidewalks, Concrete Pavers, Tube Station, Loading Dock, Asphalt Paving and Asphalt Repairs at the Loading Dock, Toilet and Bath Accessories, Medication Cabinets, Kitchen Equipment, Signage and Lockers. Delete Masonry Veneer and install Exterior Insulation Finishing System.

**Total Calendar Days for Item No. 4 (Bid Alternate #3): 550**

### **E. Bid Item # 5 (Bid Alternate #4):**

Furnish all labor, tools, materials, equipment, and supervision in Item #1, but delete labor, tools, materials, equipment and supervision to delete

installation of Dual Connecting Corridor and install Low Voltage Power Duct Bank, delete the Healing Garden, Landscape Edging, Temporary Construction Access Road, Concrete Sidewalks, Concrete Pavers, Tube Station, Loading Dock, Asphalt Paving and Asphalt Repairs at the Loading Dock, Toilet and Bath Accessories, Medication Cabinets, Kitchen Equipment, Signage and Lockers. Delete Masonry Veneer and install Exterior Insulation Finishing System.

**Total Calendar Days for Item No. 5 (Bid Alternate #4): 525**

**F. Bid Item #6 (Bid Alternate #5)**

Furnish all labor, tools, materials, equipment, and supervision in Item #1, but delete labor, tools, materials, equipment, and supervision to delete installation of Interior Walls, Ceilings, Doors, Fixtures, and Finishes for First Floor Resident Units 114, 116, 118, and 120. Interior face of Exterior Studs to be unfinished, Vapor Retarder to be installed to inside face of exterior side.

**Total Calendar Days for Item No. 6 (Bid Alternate #5): 525**

**G. Bid Item #7 (Bid Alternate #6)**

Furnish all labor, tools, materials, equipment, and supervision in Item #1, but delete labor, tools, materials, equipment, and supervision to delete installation of Interior Walls, Ceilings, Doors, Fixtures, and Finishes for First Floor Resident Units 114, 116, 118, and 120, and Second Floor Resident Units 214, 216, 218, and 220. Interior face of Exterior Studs to be unfinished, Vapor Retarder to be installed to inside face of exterior side.

**Total Calendar Days for Item #7 (Bid Alternate #6): 525**

**1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR**

- A. AFTER AWARD OF CONTRACT, specifications and drawings will be made available electronically.
- B. Contractor's Use of A/E's CAD Files: The Contractor will not be permitted to use the A/E's CAD files.

**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 these regulations.
- B. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. Contractors must obtain ID badges in accordance with Medical Center Memorandum (MCM) 05-04 "Personnel Suitability and Security Procedures. They may also be subject to inspection of their personal effects when entering or leaving the project site.

Step 1: (Upon notice of award)

Contractor will complete Contract Security Services Request (Form #1), listing all employees that will be performing work under the contract. Contract Security Verification Request Supplemental (Form #1b) may be filled out and attached if Form #1 does not provide enough space. Once completed, this form shall be submitted to the VHA Service Center (VSC) Personnel Security Office via password protected or encrypted email to VSCSecurity@va.gov or faxed to (216) 447-8020.

❖ NOTE: In this form, line F will either be "construction" or the Scope of Work may be used, and line G will be low 99.9% of the time unless the contractor will have access to sensitive information.

Step 2: (Upon notice of award, same time as Step 1)

Within five business days of Contractor receiving Notice of Award, each contract employee listed on Form #1 must take the Contractor/Employee Fingerprinting request (Form #2) and two forms of ID to their nearest VA facility to have their fingerprints submitted and the bottom portion of Form #2 completed by the fingerprinting official. Fingerprint appointments should be made through the COTR or the local VA facility. Completed SAC forms shall be faxed or mailed directly to the VSC Personnel Security Office the same day the contractor employee is fingerprinted.

VHA Service Center (VSC)  
6100 Oak Tree Blvd #500  
Independence, OH 44131  
Fax: (216) 447-8025  
VSCSecurity@va.gov

Contractor shall inform the COTR/CO when fingerprinting has been completed for each contract employee.

Step 3: (As soon as possible)

Each individual working on the contract or the contractor POC shall complete the VHA Service Center PIV Sponsorship (Form #3) for each employee, in its entirety, and return to VSC Security Office as soon as possible, either via fax, encrypted email or password protected documents. Upon receipt of this form and final results of fingerprinting confirmation, the VHA Security Service Center will send an email notification to the Contractor's POC and the CO authorizing contract employees to proceed with obtaining their required non-PIV security badge. Upon receipt of this confirmation, notify COTR so they may schedule an appointment for PIV badging. Only the individual whose name appears on the badge can pick up that badge from the badging office.

2. For working outside the "regular hours" as defined in the contract, The General Contractor shall give 3 days notice to the Contracting Officer so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
3. Contractor is solely responsible for keeping the job site secure at all times, even during working hours. The job site shall be secured in such a manner to prohibit patients, staff and unauthorized personnel from entering the work site.
4. No photography of VA premises is allowed without written permission of the Contracting Officer.
5. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the Contracting Officer's Technical Representative (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.

D. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the

approach to following goals and maintaining confidentiality of "sensitive information".

2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive But Unclassified" (SBU). Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
  - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
  - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

E. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. 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):  
E84-2012.....Surface Burning Characteristics of Building  
Materials

2. National Fire Protection Association (NFPA):

- 10-2010.....Standard for Portable Fire Extinguishers
- 30-2012.....Flammable and Combustible Liquids Code
- 51B-2009.....Standard for Fire Prevention During Welding,  
Cutting and Other Hot Work
- 70-2011.....National Electrical Code
- 241-2009.....Standard for Safeguarding Construction,  
Alteration, and Demolition Operations

3. Occupational Safety and Health Administration (OSHA):

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

- B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to Contracting Officer 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.
- 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 area and adjoining areas. Construct partitions of gypsum board on both sides of metal steel studs. Extend the partitions through suspended ceilings to deck or roof. Seal joints and penetrations. At door openings, install Class C,  $\frac{3}{4}$  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 passageways, fire-rated enclosures of hazardous areas, smoke barriers, and openings enclosures.



3. Close openings in fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.
  4. Coordinate location and construction requirements with COTR and obtain permit from the on-site VA Fire Department.
- 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.
- H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to COTR.
- 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 Officer. 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.
- N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COTR and obtain permits from facility Safety Officer at least 24 hours in advance.
- N. Fire Hazard Prevention and Safety Inspections: Inspect entire construction area weekly. Coordinate with, and report findings and corrective actions weekly to COTR.
- O. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate

and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.

- P. Dispose of waste and debris in accordance with NFPA 241. Remove from building daily.
- Q. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.
- R. If 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 COTR.
- E. Workers are subject to rules of Medical Center applicable to their conduct.

- F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others.
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 that can be stored within designated areas. Provide unobstructed access to Medical Center areas required to remain in operation.
  3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
- G. To ensure execution of work, Contractor shall furnish the COTR with a schedule of approximate dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof.
- H. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.
- I. Contractor shall furnish the COTR with a schedule of approximate dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. In addition, Contractor shall notify the COTR two weeks in advance of the proposed date of starting work in each specific area of site, building or portion thereof. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.

- J. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, 2.1m (seven feet) minimum height, around the construction area indicated on the drawings. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Remove the fence when directed by COTR. When a portion 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 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 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.
- 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 shall be entirely removed and capped or plugged at the nearest main. Openings left by removal of such items shall be filled immediately. They shall be filled in a manner that maintains fire ratings, smoke separations, and other required separations intact. Openings in finished areas shall be patched to match material, finish and color of adjacent areas.
- 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 COTR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.
- O. Contractor shall hold weekly construction meetings on-site at a location to be determined by the COTR. Contractor shall provide computer generated minutes of all meetings and shall distribute minutes to all participants within two (2) working days after said meeting. Electronic submission of minutes is required in addition to one hard copy to the COTR.
- P. Daily logs shall be electronically submitted on a daily basis to the COTR for all construction personnel, all materials brought on-site that day, work performed on that day, the weather for the day including temperature, precipitation (form and amounts) sunny, cloudy, windy or

calm as well as any contacts made that day. Sample log may be provided, if requested, in electronic format to the contractor for his distribution and use.

#### **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 building.
  - 2. Existence and conditions of items 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 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 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 COTR together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing 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 despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workers in executing work of this contract.
- D. Protection: Provide the following protective measures:

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

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

- A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. ICRA Group may monitor dust in the vicinity of the construction work and require the Contractor to take corrective action immediately if the safe levels are exceeded.
- B. Establish and maintain a dust control program as part of the contractor's infection preventive measures in accordance with the guidelines provided by ICRA Group and as specified here. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to COTR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
  1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- C. Medical Center Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality. In addition:
  1. In areas where negative pressure differential is required the contractor shall provide a manometer capable of indicating pressure differential located at the entrance to the project site. Contractor shall take twice daily readings (morning and afternoon). Contractor shall record readings in log book to be kept adjacent to the manometer and shall submit the readings to the COTR on a weekly basis.

2. 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. Upon notification, the contractor shall implement corrective measures to restore proper pressure differentials as needed.
  3. 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 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 one-hour fire-rated temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. Barriers shall be sealed and made presentable on hospital occupied side. Install a self-closing rated door in a metal frame, commensurate with the partition, to allow worker access. Maintain negative air at all times.
    - 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. 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 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 COTR.
2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.
3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.
4. PCB Transformers and Capacitors: The Contractor shall be responsible for disposal of the Polychlorinated Biphenyl (PCB) transformers and capacitors. The transformers and capacitors shall be taken out of service and handled in accordance with the procedures of the Environmental Protection Agency (EPA) and the Department of Transportation (DOT) as outlined in Code of Federal Regulation (CFR), Titled 40 and 49 respectively. The EPA's Toxic Substance Control Act (TSCA) Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7 also apply. Upon removal of PCB transformers and capacitors for disposal, the "originator" copy of the Uniform Hazardous Waste Manifest (EPA Form 8700-22), along with the Uniform Hazardous Waste Manifest Continuation Sheet (EPA Form 8700-22A) shall be returned to the COTR who will annotate the contract file and transmit the Manifest to the Medical Center's Chief.
  - a. Copies of the following listed CFR titles may be obtained from the Government Printing Office:
    - 40 CFR 261.....Identification and Listing of Hazardous Waste
    - 40 CFR 262.....Standards Applicable to Generators of Hazardous Waste
    - 40 CFR 263.....Standards Applicable to Transporters of Hazardous Waste
    - 40 CFR 761.....PCB Manufacturing, Processing, Distribution in Commerce, and use Prohibitions

49 CFR 172.....Hazardous Material tables and Hazardous Material  
Communications Regulations

49 CFR 173.....Shippers - General Requirements for Shipments  
and Packaging

49 CRR 173.....Subpart A General

49 CFR 173.....Subpart B Preparation of Hazardous Material for  
Transportation

49 CFR 173.....Subpart J Other Regulated Material; Definitions  
and Preparation

TSCA.....Compliance Program Policy Nos. 6-PCB-6 and  
6-PCB-7

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

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

#### **(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 workers 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**

- A. Data and information furnished or referred to below is for the Contractor's information. Neither the Government nor the Architect-Engineer shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

- 1. Boring samples and geotechnical information and investigation provided by Hardin-Kight Associates, Inc., Glen Burnie, MD.

**(FAR 52.236-4)**

### **1.13 PROFESSIONAL SURVEYING SERVICES**

A registered professional land surveyor or registered civil engineer whose services are retained and paid for by the Contractor shall perform services specified herein and in other specification sections.

#### **1.14 LAYOUT OF WORK**

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

**(FAR 52.236-17)**

- B. Establish and plainly mark lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for such structure and in accordance with lines and elevations shown on contract drawings.

#### **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**

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 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 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.

#### **1.18 TEMPORARY TOILETS**

Provide where directed, (for use of all Contractor's workers) ample temporary sanitary toilet accommodations with suitable sewer and water

connections; or, when approved by COTR, provide suitable dry closets where directed. Keep such places clean and free from flies, and all connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean.

#### **1.19 AVAILABILITY AND USE OF UTILITY SERVICES**

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract at no cost to the Contractor. The Contractor shall carefully conserve any utilities furnished without charge.
- B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.
- C. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:
  - 1. Obtain heat by connecting to Medical Center heating distribution system.
- D. Electricity (for Construction and Testing):
  - 1. Obtain electricity by connecting to the Medical Center electrical distribution system at location determined by the COTR. Electricity is available at no cost to the Contractor.
- E. Water (for Construction and Testing): Furnish temporary water service.
  - 1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection. Water is available at no cost to the Contractor.
  - 2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes will be cause for revocation (at COTR's discretion) of use of water from Medical Center's system.

#### **1.20 NEW TELEPHONE EQUIPMENT**

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

### **1.21 TESTS**

- A. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- B. Conduct final tests required in various sections of specifications in presence of 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.

### **1.22 INSTRUCTIONS**

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

#### **1.23 GOVERNMENT-FURNISHED PROPERTY**

- A. The Government shall deliver to the Contractor, the Government-furnished property shown on the Schedule.
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center.
- C. Storage space for equipment will be provided by the Government and the Contractor shall be prepared to unload and store such equipment therein upon its receipt at the Medical Center.
- D. Notify COTR in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government.

Arrangements will then be made by the Government for delivery of equipment.

1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
  2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.
- E. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for connections to respective services installed under contract. All fittings and appliances (i.e., couplings, ells, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.
- F. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.
- G. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

#### **1.24 RELOCATED ITEMS**

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing items indicated by symbol "R" or otherwise shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the COTR.
- C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, 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. 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.

#### **1.25 CONSTRUCTION SIGN**

- A. Provide a Construction Sign where directed by the Resident Engineer. All wood members shall be of framing lumber. Cover sign frame with 0.7 mm (24 gage) galvanized sheet steel nailed securely around edges and on all bearings. Provide three 100 by 100 mm (4 inch by 4 inch) posts (or equivalent round posts) set 1200 mm (four feet) into ground. Set bottom of sign level at 900 mm (three feet) above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with 50 x 100 mm (two by four inch) material as directed.
- B. Paint all surfaces of sign and posts two coats of white gloss paint. Border and letters shall be of black gloss paint, except project title which shall be blue gloss paint.
- C. Maintain sign and remove it when directed by the Resident Engineer.
- D. Detail Drawing of construction sign showing required legend and other characteristics of sign is shown on the drawings.

#### **1.26 SAFETY SIGN**

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

#### **1.27 PHOTOGRAPHIC DOCUMENTATION**

- A. During the construction period through completion, provide photographic documentation of construction progress and at selected milestones including electronic indexing, navigation, storage and remote access to

the documentation, as per these specifications. The commercial photographer or the subcontractor used for this work shall meet the following qualifications:

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

B. Photographic documentation elements:

1. Each digital image shall be taken with a professional grade camera with minimum size of 6 megapixels (MP) capable of producing 200x250mm (8 x 10 inch) prints with a minimum of 2272 x 1704 pixels and 400x500mm (16 x 20 inch) prints with a minimum 2592 x 1944 pixels.
2. Indexing and navigation system shall utilize actual AUTOCAD construction drawings, making such drawings interactive on an on-line interface. For all documentation referenced herein, indexing and navigation must be organized by both time (date-stamped) and location throughout the project.
3. Documentation shall combine indexing and navigation system with inspection-grade digital photography designed to capture actual conditions throughout construction and at critical milestones. Documentation shall be accessible on-line through use of an internet connection. Documentation shall allow for secure multiple-user access, simultaneously, on-line.
4. Before construction, the building pad, adjacent streets, roadways, parkways, driveways, curbs, sidewalks, landscaping, adjacent utilities and adjacent structures surrounding the building pad and site shall be documented. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings. If site work or pad preparation is extensive, this documentation may be required immediately before construction and at several pre-determined intervals before building work commences.
5. Construction progress for all trades shall be tracked at pre-determined intervals, but not less than once every thirty (30) calendar days ("Progressions"). Progression documentation shall track both the exterior and interior construction of the building. Exterior Progressions shall track 360 degrees around the site and

each building. Interior Progressions shall track interior improvements beginning when stud work commences and continuing until Project completion.

6. As-built condition of pre-slab utilities and site utilities shall be documented prior to pouring slabs, placing concrete and/or backfilling. This process shall include all underground and in-slab utilities within the building(s) envelope(s) and utility runs in the immediate vicinity of the building(s) envelope(s). This may also include utilities enclosed in slab-on-deck in multi-story buildings. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive site utility plans.
7. As-built conditions of mechanical, electrical, plumbing and all other systems shall be documented post-inspection and pre-insulation, sheet rock or dry wall installation. This process shall include all finished systems located in the walls and ceilings of all buildings at the Project. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
8. As-built conditions of exterior skin and elevations shall be documented with an increased concentration of digital photographs as directed by the COTR in order to capture pre-determined focal points, such as waterproofing, window flashing, radiused steel work, architectural or Exterior Insulation and Finish Systems (EIFS) detailing. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive elevations or elevation details.
9. As-built finished conditions of the interior of each building including floors, ceilings and walls shall be documented at certificate of occupancy or equivalent, or just prior to occupancy, or both, as directed by the COTR. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
10. Miscellaneous events that occur during any Contractor site visit, or events captured by the Department of Veterans Affairs independently, shall be dated, labeled and inserted into a Section in the navigation structure entitled "Slideshows," allowing this information to be stored in the same "place" as the formal scope.
11. Customizable project-specific digital photographic documentation of other details or milestones. Indexing and navigation accomplished through interactive architectural plans.

12. Monthly (29 max) exterior progressions (360 degrees around the project) and slideshows (all elevations and building envelope). The slideshows allow for the inclusion of Department of Veterans Affairs pictures, aerial photographs, and timely images which do not fit into any regular monthly photopath.
  13. Weekly (21 Max) Site Progressions - Photographic documentation capturing the project at different stages of construction. These progressions shall capture underground utilities, excavation, grading, backfill, landscaping and road construction throughout the duration of the project.
  14. Regular (8 max) interior progressions of all walls of the entire project to begin at time of substantial framed or as directed by the COTR through to completion.
  15. Detailed Exact-Built of all Slabs for all project slab pours just prior to placing concrete or as directed by the COTR.
  16. Detailed Interior exact built overlapping photos of the entire building to include documentation of all mechanical, electrical and plumbing systems in every wall and ceiling, to be conducted after rough-ins are complete, just prior to insulation and or drywall, or as directed by COTR.
  17. Finished detailed Interior exact built overlapping photos of all walls, ceilings, and floors to be scheduled by COTR prior to occupancy.
  18. In event a greater or lesser number of images than specified above are required by the COTR, adjustment in contract price will be made in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Images shall be taken by a commercial photographer and must show distinctly, at as large a scale as possible, all parts of work embraced in the picture.
- D. Coordination of photo shoots is accomplished through COTR. Contractor shall also attend construction team meetings as necessary. Contractor's operations team shall provide regular updates regarding the status of the documentation, including photo shoots concluded, the availability of new Progressions or Exact-Built viewable on-line and anticipated future shoot dates.
- E. Contractor shall provide all on-line domain/web hosting, security measures, and redundant server back-up of the documentation.
- F. Contractor shall provide technical support related to using the system or service.

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

#### **1.28 FINAL ELEVATION DIGITAL IMAGES**

- A. A minimum of four (4) images of each elevation shall be taken with a minimum 6 MP camera, by a professional photographer with different settings to allow the COTR to select the image to be printed. All images are provided to the COTR on a CD.
- B. Photographs shall be taken upon completion, including landscaping. They shall be taken on a clear sunny day to obtain sufficient detail to show depth and to provide clear, sharp pictures. Pictures shall be 400 mm x 500 mm (16 by 20 inches), printed on regular weight paper, matte finish archival grade photographic paper and produced by a RA4 process from the digital image with a minimum 300 PPI. Identifying data shall be carried on label affixed to back of photograph without damage to photograph and shall be similar to that provided for final construction photographs.
- C. Furnish six (6) 400 mm x 500 mm (16 by 20 inch) color prints of the following buildings constructed under this project (elevations as selected by the RE from the images taken above). Photographs shall be artistically composed showing full front elevations. All images shall become property of the Government. Each of the selected six prints shall be place in a frame with a minimum of 2 inches of appropriate matting as a border. Provide a selection of a minimum of 3 different frames from which the COTR will select one style to frame all six prints. Photographs with frames shall be delivered to the COTR in boxes suitable for shipping.
1. Connecting Corridor.
  2. Dementia Building No. 513.

#### **1.29 CONSTRUCTION SAFETY REQUIREMENTS**

##### **A. REFERENCES**

The publications listed below form a part of this specification to the extent referenced.

The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.32 (2004) Fall Protection

ASSE/SAFE A10.3 (2001; R 2005) Protection of the Public on or Adjacent to Construction Sites

ASSE/SAFE Z359.1 (2007) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

ASME INTERNATIONAL (ASME)

ASME B30.22 Articulating Boom Cranes

(2007) Mobile and Locomotive Cranes

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (2010) Standard for Portable Fire Extinguishers

NFPA 241 (2009) Standard for Safeguarding Construction, Alteration, and Demolition Operations

NFPA 306 (2009) Standard for Control of Gas Hazards in Vessels

NFPA 51B (2009) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work

NFPA 70 (2011) National Electrical Code - 2011 Edition

NFPA 70E (2009; Errata 2009) Standard for Electrical Safety in the Workplace

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 20 Standards for Protection Against Radiation

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1910.146 Permit-required Confined Spaces

29 CFR 1919 Gear Certification

29 CFR 1926 Safety and Health Regulations for Construction

29 CFR 1926.500 Fall Protection

VHA Construction Safety Guide: web link

(<http://vaww.ceosh.med.va.gov/ceosh/Guidebooks/ConstructionSafety/ConstructionSafetyGuidebook.htm>)

Army Corp of Engineers



B. SAFETY PLAN

1. Safety plan must be submitted and approved by Contracting Officer prior to starting any and all work activities.
2. Safety Plan must include the following:
  - a. Preconstruction Submittals
  - b. Accident Prevention Plan (APP)
  - c. Job Hazard Analysis (JHA)
  - d. Crane Critical Lift Plan
  - e. Proof of qualification for Crane Operators
  - f. West Virginia Crane Operators License
  - g. Test Reports
  - h. OSHA 10 and 30 Hour Cards

C. REPORTS

1. Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."
  - a. Accident Reports
  - b. Confined Space Entry Permit
  - c. Hot work permit Smoke
  - d. Fire Wall Penetration Permit
  - e. Trenching Permit
  - f. License Certificates
- a. Certificate of Compliance (Crane): Submit one copy of each permit/certificate attached to each Daily Quality Control Report.
- b. Machinery & Mechanized Equipment Certification Form

D. DEFINITIONS

1. Competent Person for Fall Protection. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as their application and use with related equipment, and has the authority to take prompt corrective measures to eliminate the hazards of falling.
2. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.
3. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a

physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

4. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:

- a. Death, regardless of the time between the injury and death, or the length of the illness;
- b. Days away from work (any time lost after day of injury/illness onsite);
- c. Restricted work;
- d. Transfer to another job;
- e. Medical treatment beyond first aid;
- f. Loss of consciousness; or
- g. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

E. REGULATORY REQUIREMENTS

1. In addition to the detailed requirements included in the provisions of this contract, comply with the most recent addition of the VHA Construction Safety Guidebook, and federal, state, and local, laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

F. SITE QUALIFICATIONS, DUTIES AND MEETINGS

Site Safety and Health Officer (SSHO): The contractor shall provide a Safety oversight team that includes a minimum of one (1) Competent Person at each project site to function as the Safety and Health Officer (SSHO) . The SSHO shall be at the work site at all times, unless specified differently in the contract, to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor, and their training, experience, and qualifications shall be as required by VHA Construction Safety Guide. A Competent Personal shall be provided for all of the hazards identified in the Contractor's Safety and Health Program in accordance with the accepted Accident Prevention Plan, and shall be on-site at all times when the work that presents the hazards associated with their professional expertise is being performed. The

credentials of the Competent Persons(s) shall be approved by the Contracting Officer in consultation with the Safety Office.

1. The Contractor Quality Control (QC) person can be the SSHO on this project.
2. The SSHO, as a minimum, must have completed the 30-hour OSHA Construction Safety class. The SSHO is also required to have five (5) years of construction industry safety experience or three (3) years of construction safety experience if in possession of a Certified Safety Profession (CSP) or safety and health degree.
3. Competent Person for Confined Space Entry. Provide a competent person for confined space meeting the definition and requirements of VHA Construction Safety Guide. All confined space and enclosed space work shall comply with 1.6F.3.
4. Crane Operators. Meet the crane operators' requirements in the VHA Construction Safety Guide. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacities of 50,000 pounds or greater, designate crane operators as qualified by a source qualifies crane operators (i.e., union, a government agency, or/and organization that tests and qualifies crane operators). Provide proof of current qualification.
6. Personnel Duties
7. Site Safety and Health Officer (SSHO)
  - a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Attach safety inspection logs to the Contractors' daily quality control report. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and subcontractors.
  - b. Maintain applicable safety reference material on the job site.
  - c. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.
  - d. Implement and enforce accepted APPS and JHAs.
  - e. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. Post a list of unresolved safety and health deficiencies on the safety bulletin board.
  - f. Maintain a list of hazardous chemicals on site and their material

safety data sheets

G. ACCIDENT PREVENTION PLAN (APP)

1. Use a qualified person to prepare the written site-specific APP.  
Prepare the APP in accordance with the format and requirements of the VHA Construction Safety Guide and as supplemented herein. Cover all paragraph and subparagraph elements in the VHA Construction Safety Guide.
2. Specific requirements for some of the APP elements are described below. The APP shall be job-specific and address any unusual or unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer, the Contractor Quality control Manager, and any designated CSP and/or CIH.
3. Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.
4. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and quality control manager. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim,

take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34) and the environment.

5. Copies of the accepted plan will be maintained at the Contracting Officer's office and at the job site. Continuously reviewed and amended the APP, as necessary, throughout the life of the contract. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered.
6. VHA Construction Safety Guide Contents: In addition to the requirements outlined in the VHA Construction Safety Guide, the following is required:
  - a. Names and qualifications (resumes including education, training, experience and certifications) of all site safety and health personnel designated to perform work on this project to include the designated site safety and health officer and other competent and qualified personnel to be used such as CSPs, CIHs, STSs, CHSTs. Specify the duties of each position.
  - b. Qualifications of competent and of qualified persons. As a minimum, designate and submit qualifications of competent persons for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; personal protective equipment and clothing to include selection, use and maintenance.
  - c. Confined Space Entry Plan. Develop a confined and/or enclosed space entry plan in accordance with VHA Construction Safety Guide, applicable OSHA standards, 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, OSHA Directive 2.100, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)
  - d. Crane Critical Lift Plan. Prepare and sign weight handling critical lift plans for lifts over 75 percent of the capacity of the crane or hoist (or lifts over 50 percent of the capacity of a

barge mounted mobile crane's hoists) at any radius of lift; lifts involving more than one crane or hoist; lifts of personnel; and lifts involving non-routine rigging or operation, sensitive equipment, or unusual safety risks. Submit 15 calendar days prior to on-site work and include the requirements of VHA Construction Safety Guide, and the following:

1. For lifts of personnel, demonstrate compliance with the requirements of 29 CFR 1926.550(g).
- e. Fall Protection and Prevention (FP&P) Program Documentation. The program documentation shall be site specific and address all fall hazards in the work place and during different phases of construction. Address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 6 feet. A qualified person for fall protection shall prepare and sign the program documentation. Include fall protection and prevention systems, equipment and methods employed for every phase of work, responsibilities, assisted rescue, self-rescue and evacuation procedures, training requirements, and monitoring methods. Revise the Fall Protection and Prevention Program documentation every six months, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. Keep and maintain the accepted Fall Protection and Prevention Program documentation at the job site for the duration of the project. Include the Fall Protection and Prevention Program documentation in the Accident Prevention Plan (APP).
- f. Asbestos Hazard Abatement Plan. The safety and health aspects of asbestos work, prepared in accordance with Section 02 82 11.00 10, TRADITIONAL ASBESTOS ABATEMENT
- g. Site Demolition Plan. The safety and health aspects prepared in accordance with Section 02 41 00, DEMOLITION and referenced sources. Include engineering survey as applicable.
7. The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. The Contractor shall report this data in the manner prescribed by the Contracting Officer.

**(FAR 52.236-13(c))**

H. JOB HAZARD ANALYSIS (JHA)

The Job Hazard Analysis (JHA) format shall be performed in accordance with OSHA 3071 (R2002)

<http://www.osha.gov/Publications/osh3071.pdf>) and the requirements of chapters 2 through 17 of the VHA Construction Safety Guide. Submit the JHA for review at least 15 calendar days prior to the start of each phase. Format subsequent JHAs as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls. The JHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

1. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. Any activities listed on the project schedule may require a JHA. The JHAs will be developed by the contractor, supplier or subcontractor and provided to the prime contractor for submittal to the Contracting Officer. A JHA shall be prepared for all activities comprising:
  - a. Jobs with the highest injury or illness rates; Jobs with potential to cause severe or disabling injuries or illness, even if no previous history of accidents;
  - b. Jobs in which one simple human error could lend to severe accident or injury;
  - c. Jobs that are new to operators or have undergone changes in procedures and processes;
  - d. All jobs applicable from VHA Construction Safety Guide for which MAJOR OSHA VIOLATIONS as noted in the Guide text.

#### I. CONSTRUCTION AND/OR OTHER WORK

1. Comply with VHA Construction Safety Guide, NFPA 241, the APP, the AHA, Federal and/or State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard prevails.
2. Hazardous Material Use
  - a. Each hazardous material must receive approval from the Contracting Office or their designated representative prior to being brought onto the job site or prior to any other use in connection with this contract.
  - b. Allow a minimum of 10 working days for processing of the request for use of a hazardous material.
3. Hazardous Material Exclusions
  - a. Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of

producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with VHA Construction Safety Guide, such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint are prohibited.

- b. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials.
- c. The Radiation Safety Officer (RSO) must be notified prior to excepted items of radioactive material and devices being brought on base.

#### 4. Unforeseen Hazardous Material

- a. The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e. 29 CFR Part 1910.1000). If [additional] material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If the material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

#### J. SCAFFOLDING

- 1. Provide employees with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Access scaffold platforms greater than 20 feet maximum in height by use of a scaffold stair system. Do not use vertical ladders commonly provided by scaffold system manufacturers for accessing scaffold platforms greater than 20 feet maximum in height.
- 2. The use of an adequate gate is required.
- 3. Ensure that employees are qualified to perform scaffold erection and dismantling.
- 4. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall



protection as delineated in the accepted fall protection and prevention plan.

5. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward.
6. Give special care to ensure scaffold systems are not overloaded.
7. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material are prohibited.
8. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base.
9. Place work platforms on mud sills.
10. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet.
11. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Job Hazard Analysis (JHA) for the phase

#### K. EXCAVATIONS

1. Contractor shall perform soil classification by a competent person in accordance with 29 CFR 1926.
2. Utility Locations
  - a. Prior to digging, the appropriate digging permit must be obtained.
  - b. All underground utilities in the work area must be positively identified by a private utility locating service in addition to any station locating service and coordinated with the station utility department.
  - c. Any markings made during the utility investigation must be maintained throughout the contract.
3. Utility Location Verification
  - a. The Contractor must physically verify underground utility locations by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system.
  - b. Digging within 2 feet of a known utility must not be performed by means of mechanical equipment; hand digging shall be used.
  - c. If construction is parallel to an existing utility expose the utility by hand digging every 100 feet if parallel within 5 feet of the excavation.
4. Shoring Systems
  - a. Trench and shoring systems must be identified in the accepted

safety plan and JHA.

- b. Manufacture tabulated data and specifications or registered engineer tabulated data for shoring or benching systems shall be readily available on-site for review.
- c. Job-made shoring or shielding must have the registered professional engineer stamp, specifications, and tabulated data.

#### L. WORK IN CONFINED SPACES

Comply with the requirements of the VHA Construction Safety Guide, OSHA 29 CFR 1910.146 and OSHA 29 CFR 1926.21(b) (6). Any potential for a hazard in the confined space requires a permit system to be used. NOTE: The Contractor shall submit documentation, before starting work, that Contractor employees entering confined spaces have received confined space training or re-training within the last 12 months.

##### 1. Entry Procedures.

- a. Obtain confined space entry permit from the VA Fire Department

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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 COTR on behalf of the Contracting Officer.
- 1.6 Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1.7 The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional

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

- 1.8 Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect-Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- 1.9 Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.
  - A. Submit samples required by Section 09 06 00, SCHEDULE FOR FINISHES, in quadruplicate. Submit other samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
  - B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail 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. 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.
- D. Approved samples will be kept on file by the COTR 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.
- E. 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:
- C.C. Hodgson Architectural Group
- 1225 Eye Street NW, Suite 100
- Washington, DC 20005
- 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 COTR.

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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. <a href="http://www.aluminum.org">http://www.aluminum.org</a>
AABC	Associated Air Balance Council <a href="http://www.aabchq.com">http://www.aabchq.com</a>
AAMA	American Architectural Manufacturer's Association <a href="http://www.aamanet.org">http://www.aamanet.org</a>
AAN	American Nursery and Landscape Association <a href="http://www.anla.org">http://www.anla.org</a>
AASHTO	American Association of State Highway and Transportation Officials <a href="http://www.aashto.org">http://www.aashto.org</a>
AATCC	American Association of Textile Chemists and Colorists <a href="http://www.aatcc.org">http://www.aatcc.org</a>
ACGIH	American Conference of Governmental Industrial Hygienists <a href="http://www.acgih.org">http://www.acgih.org</a>
ACI	American Concrete Institute <a href="http://www.aci-int.net">http://www.aci-int.net</a>
ACPA	American Concrete Pipe Association <a href="http://www.concrete-pipe.org">http://www.concrete-pipe.org</a>
ACPPA	American Concrete Pressure Pipe Association <a href="http://www.acppa.org">http://www.acppa.org</a>
ADC	Air Diffusion Council <a href="http://flexibleduct.org">http://flexibleduct.org</a>
AGA	American Gas Association <a href="http://www.aga.org">http://www.aga.org</a>



AGC	Associated General Contractors of America <a href="http://www.agc.org">http://www.agc.org</a>
AGMA	American Gear Manufacturers Association, Inc. <a href="http://www.agma.org">http://www.agma.org</a>
AHAM	Association of Home Appliance Manufacturers <a href="http://www.aham.org">http://www.aham.org</a>
AISC	American Institute of Steel Construction <a href="http://www.aisc.org">http://www.aisc.org</a>
AISI	American Iron and Steel Institute <a href="http://www.steel.org">http://www.steel.org</a>
AITC	American Institute of Timber Construction <a href="http://www.aitc-glulam.org">http://www.aitc-glulam.org</a>
AMCA	Air Movement and Control Association, Inc. <a href="http://www.amca.org">http://www.amca.org</a>
ANLA	American Nursery & Landscape Association <a href="http://www.anla.org">http://www.anla.org</a>
ANSI	American National Standards Institute, Inc. <a href="http://www.ansi.org">http://www.ansi.org</a>
APA	The Engineered Wood Association <a href="http://www.apawood.org">http://www.apawood.org</a>
ARI	Air-Conditioning and Refrigeration Institute <a href="http://www.ari.org">http://www.ari.org</a>
ASAE	American Society of Agricultural Engineers <a href="http://www.asae.org">http://www.asae.org</a>
ASCE	American Society of Civil Engineers <a href="http://www.asce.org">http://www.asce.org</a>
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers <a href="http://www.ashrae.org">http://www.ashrae.org</a>

ASME	American Society of Mechanical Engineers <a href="http://www.asme.org">http://www.asme.org</a>
ASSE	American Society of Sanitary Engineering <a href="http://www.asse-plumbing.org">http://www.asse-plumbing.org</a>
ASTM	American Society for Testing and Materials <a href="http://www.astm.org">http://www.astm.org</a>
AWI	Architectural Woodwork Institute <a href="http://www.awinet.org">http://www.awinet.org</a>
AWS	American Welding Society <a href="http://www.aws.org">http://www.aws.org</a>
AWWA	American Water Works Association <a href="http://www.awwa.org">http://www.awwa.org</a>
BHMA	Builders Hardware Manufacturers Association <a href="http://www.buildershardware.com">http://www.buildershardware.com</a>
BIA	Brick Institute of America <a href="http://www.bia.org">http://www.bia.org</a>
CAGI	Compressed Air and Gas Institute <a href="http://www.cagi.org">http://www.cagi.org</a>
CGA	Compressed Gas Association, Inc. <a href="http://www.cganet.com">http://www.cganet.com</a>
CI	The Chlorine Institute, Inc. <a href="http://www.chlorineinstitute.org">http://www.chlorineinstitute.org</a>
CISCA	Ceilings and Interior Systems Construction Association <a href="http://www.cisca.org">http://www.cisca.org</a>
CISPI	Cast Iron Soil Pipe Institute <a href="http://www.cispi.org">http://www.cispi.org</a>
CLFMI	Chain Link Fence Manufacturers Institute <a href="http://www.chainlinkinfo.org">http://www.chainlinkinfo.org</a>

CPMB	Concrete Plant Manufacturers Bureau <a href="http://www.cpmc.org">http://www.cpmc.org</a>
CRA	California Redwood Association <a href="http://www.calredwood.org">http://www.calredwood.org</a>
CRSI	Concrete Reinforcing Steel Institute <a href="http://www.crsi.org">http://www.crsi.org</a>
CTI	Cooling Technology Institute <a href="http://www.cti.org">http://www.cti.org</a>
DHI	Door and Hardware Institute <a href="http://www.dhi.org">http://www.dhi.org</a>
EGSA	Electrical Generating Systems Association <a href="http://www.egsa.org">http://www.egsa.org</a>
EEI	Edison Electric Institute <a href="http://www.eei.org">http://www.eei.org</a>
EPA	Environmental Protection Agency <a href="http://www.epa.gov">http://www.epa.gov</a>
ETL	ETL Testing Laboratories, Inc. <a href="http://www.etl.com">http://www.etl.com</a>
FAA	Federal Aviation Administration <a href="http://www.faa.gov">http://www.faa.gov</a>
FCC	Federal Communications Commission <a href="http://www.fcc.gov">http://www.fcc.gov</a>
FPS	The Forest Products Society <a href="http://www.forestprod.org">http://www.forestprod.org</a>
GANNA	Glass Association of North America <a href="http://www.cssinfo.com/info/ganna.html/">http://www.cssinfo.com/info/ganna.html/</a>
FM	Factory Mutual Insurance <a href="http://www.fmglobal.com">http://www.fmglobal.com</a>

GA	Gypsum Association <a href="http://www.gypsum.org">http://www.gypsum.org</a>
GSA	General Services Administration <a href="http://www.gsa.gov">http://www.gsa.gov</a>
HI	Hydraulic Institute <a href="http://www.pumps.org">http://www.pumps.org</a>
HPVA	Hardwood Plywood & Veneer Association <a href="http://www.hpva.org">http://www.hpva.org</a>
ICBO	International Conference of Building Officials <a href="http://www.icbo.org">http://www.icbo.org</a>
ICEA	Insulated Cable Engineers Association Inc. <a href="http://www.icea.net">http://www.icea.net</a>
\ICAC	Institute of Clean Air Companies <a href="http://www.icac.com">http://www.icac.com</a>
IEEE	Institute of Electrical and Electronics Engineers <a href="http://www.ieee.org/">http://www.ieee.org/</a>
IMSA	International Municipal Signal Association <a href="http://www.imsasafety.org">http://www.imsasafety.org</a>
IPCEA	Insulated Power Cable Engineers Association
NBMA	Metal Buildings Manufacturers Association <a href="http://www.mbma.com">http://www.mbma.com</a>
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc. <a href="http://www.mss-hq.com">http://www.mss-hq.com</a>
NAAMM	National Association of Architectural Metal Manufacturers <a href="http://www.naamm.org">http://www.naamm.org</a>
NAPHCC	Plumbing-Heating-Cooling Contractors Association <a href="http://www.phccweb.org.org">http://www.phccweb.org.org</a>

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 <a href="http://www.portcement.org">http://www.portcement.org</a>
PCI	Precast Prestressed Concrete Institute <a href="http://www.pci.org">http://www.pci.org</a>
PPI	The Plastic Pipe Institute <a href="http://www.plasticpipe.org">http://www.plasticpipe.org</a>
PEI	Porcelain Enamel Institute, Inc. <a href="http://www.porcelainenamel.com">http://www.porcelainenamel.com</a>
PTI	Post-Tensioning Institute <a href="http://www.post-tensioning.org">http://www.post-tensioning.org</a>
RFCI	The Resilient Floor Covering Institute <a href="http://www.rfci.com">http://www.rfci.com</a>
RIS	Redwood Inspection Service See - CRA
RMA	Rubber Manufacturers Association, Inc. <a href="http://www.rma.org">http://www.rma.org</a>
SCMA	Southern Cypress Manufacturers Association <a href="http://www.cypressinfo.org">http://www.cypressinfo.org</a>
SDI	Steel Door Institute <a href="http://www.steeldoor.org">http://www.steeldoor.org</a>
IGMA	Insulating Glass Manufacturers Alliance <a href="http://www.igmaonline.org">http://www.igmaonline.org</a>
SJI	Steel Joist Institute <a href="http://www.steeljoist.org">http://www.steeljoist.org</a>
SMACNA	Sheet Metal and Air-Conditioning Contractors National Association, Inc. <a href="http://www.smacna.org">http://www.smacna.org</a>
SSPC	The Society for Protective Coatings <a href="http://www.sspc.org">http://www.sspc.org</a>

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

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

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

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

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

UBC      The Uniform Building Code  
See ICBO

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

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

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

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

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

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**SECTION 01 45 29**  
**TESTING LABORATORY SERVICES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 APPLICABLE PUBLICATIONS:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
  - T27-06.....Sieve Analysis of Fine and Coarse Aggregates
  - T96-02 (R2006).....Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
  - T99-01 (R2004).....The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
  - T104-99 (R2003).....Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
  - T180-01 (R2004).....Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
  - T191-02(R2006).....Density of Soil In-Place by the Sand-Cone Method
- C. American Concrete Institute (ACI):
  - 506.4R-94 (R2004).....Guide for the Evaluation of Shotcrete
- D. American Society for Testing and Materials (ASTM):
  - A325-06.....Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  - A370-07.....Definitions for Mechanical Testing of Steel Products
  - A416/A416M-06.....Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
  - A490-06.....Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
  - C31/C31M-06.....Making and Curing Concrete Test Specimens in the Field



C33-03.....	Concrete Aggregates
C39/C39M-05.....	Compressive Strength of Cylindrical Concrete Specimens
C109/C109M-05.....	Compressive Strength of Hydraulic Cement Mortars
C138-07.....	Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
C140-07.....	Sampling and Testing Concrete Masonry Units and Related Units
C143/C143M-05.....	Slump of Hydraulic Cement Concrete
C172-07.....	Sampling Freshly Mixed Concrete
C173-07.....	Air Content of freshly Mixed Concrete by the Volumetric Method
C330-05.....	Lightweight Aggregates for Structural Concrete
C567-05.....	Density Structural Lightweight Concrete
C780-07.....	Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C1019-08.....	Sampling and Testing Grout
C1064/C1064M-05.....	Freshly Mixed Portland Cement Concrete
C1077-06.....	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
C1314-07.....	Compressive Strength of Masonry Prisms
D698-07.....	Laboratory Compaction Characteristics of Soil Using Standard Effort
D1143-07.....	Piles Under Static Axial Compressive Load
D1188-07.....	Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D1556-07.....	Density and Unit Weight of Soil in Place by the Sand-Cone Method
D1557-07.....	Laboratory Compaction Characteristics of Soil Using Modified Effort
D2166-06.....	Unconfined Compressive Strength of Cohesive Soil
D2167-94(R2001).....	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
D2216-05.....	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2922-05.....	Density of soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D2974-07.....Moisture, Ash, and Organic Matter of Peat and  
Other Organic Soils

D3666-(2002).....Minimum Requirements for Agencies Testing and  
Inspection Bituminous Paving Materials

D3740-07.....Minimum Requirements for Agencies Engaged in the  
Testing and Inspecting Road and Paving Material

E94-04.....Radiographic Testing

E164-03.....Ultrasonic Contact Examination of Weldments

E329-07.....Agencies Engaged in Construction Inspection  
and/or Testing

E543-06.....Agencies Performing Non-Destructive Testing

E605-93(R2006).....Thickness and Density of Sprayed Fire-Resistive  
Material (SFRM) Applied to Structural Members

E709-(2001).....Guide for Magnetic Particle Examination

E1155-96(R2008).....Determining FF Floor Flatness and FL Floor  
Levelness Numbers

E. American Welding Society (AWS):

D1.1-07.....Structural Welding Code-Steel

### **1.3 REQUIREMENTS:**

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E 329, C 1077, D 3666, D3740, A 880, E 543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by COTR. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of COTR to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to COTR, Contractor, unless other arrangements are agreed to in writing by the COTR. Submit reports of tests that fail to meet construction contract requirements on colored paper.

D. Verbal Reports: Give verbal notification to COTR immediately of any irregularity.

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

**PART 3 - EXECUTION**

**3.1 EARTHWORK:**

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

1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the COTR regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to COTR extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
2. Provide part time observation of fill placement and compaction and field density testing in building areas and provide part time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with AASHTO T99.
2. Make field density tests in accordance with the primary testing method following AASHTO T238 wherever possible. Field density tests utilizing AASHTO T191 shall be used on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the COTR before the tests are conducted.
  - a. Building Slab Subgrade: At least one test of subgrade for every 185 m<sup>2</sup> (2000 square feet) of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test

for every 185 m<sup>2</sup> (2000 square feet) of overlaying building slab, but in no case fewer than three tests.

- b. Foundation Wall Backfill: One test per 30 m (100 feet) of each layer of compacted fill but in no case fewer than two tests.
  - c. Pavement Subgrade: One test for each 335 m<sup>2</sup> (400 square yards), but in no case fewer than two tests.
  - d. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.
  - e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
  - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to COTR. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.
- C. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- D. Testing Materials: Test suitability of on-site and off-site borrow as directed by COTR.

### **3.2 LANDSCAPING:**

- A. Test topsoil for organic materials, pH, phosphate, potash content, and gradation of particles.
  - 1. Test for organic material by using ASTM D2974.
  - 2. Determine percent of silt, sand, clay, and foreign materials such as rock, roots, and vegetation.
- B. Submit laboratory test report of topsoil to COTR.

### **3.3 ASPHALT CONCRETE PAVING:**

- A. Aggregate Base Course:
  - 1. Determine maximum density and optimum moisture content for aggregate base material in accordance with AASHTO T180, Method D.
  - 2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with AASHTO T191.

3. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.

**B. Asphalt Concrete:**

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

**3.4 SITE WORK CONCRETE:**

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

**3.5 CONCRETE:**

**A. Batch Plant Inspection and Materials Testing:**

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

B. Field Inspection and Materials Testing:

1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.
3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 m<sup>3</sup> (50 cubic yards) or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. After good concrete quality control has been established and maintained as determined by COTR make three cylinders for each 80 m<sup>3</sup> (100 cubic yards) or less of each concrete type, and at least three cylinders from any one day's pour for each concrete type. Label each cylinder with an identification number. COTR may require additional cylinders to be molded and cured under job conditions.
4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump.
5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 20 m<sup>3</sup> (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m<sup>3</sup> (100 cubic yards) at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.

9. Verify that specified mixing has been accomplished.
10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
  - a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
  - b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
15. Observe preparations for placement of concrete:
  - a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
  - b. Inspect preparation of construction, expansion, and isolation joints.
16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
17. Observe concrete mixing:
  - a. Monitor and record amount of water added at project site.
  - b. Observe minimum and maximum mixing times.
18. Measure concrete flatwork for levelness and flatness as follows:
  - a. Perform Floor Tolerance Measurements  $F_F$  and  $F_L$  in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.

- b. Perform all floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
  - c. Provide the Contractor and the COTR with the results of all profile tests, including a running tabulation of the overall  $F_F$  and  $F_L$  values for all slabs installed to date, within 72 hours after each slab installation.
19. Other inspections:
- a. Grouting under base plates.
  - b. Grouting anchor bolts and reinforcing steel in hardened concrete.
- C. Laboratory Tests of Field Samples:
- 1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by COTR. Compile laboratory test reports as follows:  
Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
  - 2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
  - 3. Furnish certified compression test reports (duplicate) to COTR. In test report, indicate the following information:
    - a. Cylinder identification number and date cast.
    - b. Specific location at which test samples were taken.
    - c. Type of concrete, slump, and percent air.
    - d. Compressive strength of concrete in MPa (psi).
    - e. Weight of lightweight structural concrete in  $\text{kg/m}^3$  (pounds per cubic feet).
    - f. Weather conditions during placing.
    - g. Temperature of concrete in each test cylinder when test cylinder was molded.
    - h. Maximum and minimum ambient temperature during placing.
    - i. Ambient temperature when concrete sample in test cylinder was taken.
    - j. Date delivered to laboratory and date tested.

### **3.6 REINFORCEMENT:**

- A. Review mill test reports furnished by Contractor.



- B. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.
- C. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

### **3.7 MASONRY:**

- A. Mortar Tests:
  - 1. Laboratory compressive strength test:
    - a. Comply with ASTM C780.
    - b. Obtain samples during or immediately after discharge from batch mixer.
    - c. Furnish molds with 50 mm (2 inch), 3 compartment gang cube.
    - d. Test one sample at 7 days and 2 samples at 28 days.
  - 2. Two tests during first week of operation; one test per week after initial test until masonry completion.
- B. Grout Tests:
  - 1. Laboratory compressive strength test:
    - a. Comply with ASTM C1019.
    - b. Test one sample at 7 days and 2 samples at 28 days.
    - c. Perform test for each 230 m<sup>2</sup> (2500 square feet) of masonry.
- C. Masonry Unit Tests:
  - 1. Laboratory Compressive Strength Test:
    - a. Comply with ASTM C140.
    - b. Test 3 samples for each 460 m<sup>2</sup> (5000 square feet) of wall area.
- D. Prism Tests: For each type of wall construction indicated, test masonry prisms per ASTM C1314 for each 460 m<sup>2</sup> (5000 square feet) of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

### **3.8 STRUCTURAL STEEL:**

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

5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.

C. Fabrication and Erection:

1. Weld Inspection:

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

2. Bolt Inspection:

- a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
  - b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
  - c. Fully Pre-tensioned Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in 25 percent of connections in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
  - d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
  - e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
  - f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.
- D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to COTR.

### **3.9 STEEL DECKING:**

- A. Provide field inspection of welds of metal deck to the supporting steel, and testing services to insure steel decking has been installed in accordance with contract documents and manufacturer's requirements.
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1. Refer to the "Plug Weld Qualification Procedure" in Part 3 "Field Quality Control."
- C. Submit inspection reports, certification, and instances of noncompliance to COTR.

### **3.10 SPRAYED-ON FIREPROOFING:**

- A. Provide field inspection and testing services to certify sprayed-on fireproofing has been applied in accordance with contract documents.
- B. Obtain a copy of approved submittals from COTR.
- C. Use approved installation in test areas as criteria for inspection of work.

D. Test sprayed-on fireproofing for thickness and density in accordance with ASTM E605.

1. Thickness gauge specified in ASTM E605 may be modified for pole extension so that overhead sprayed material can be reached from floor.

E. Location of test areas for field tests as follows:

1. Thickness: Select one bay per floor, or one bay for each 930 m<sup>2</sup> (10,000 square feet) of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Metal deck, beam, and column.
2. Density: Take density determinations from each floor, or one test from each 930 m<sup>2</sup> (10,000 square feet) of floor area, whichever provides for greater number of tests, from each of the following areas: Underside of metal deck, beam flanges, and beam web.

F. Submit inspection reports, certification, and instances of noncompliance to COTR.

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**SECTION 01 57 19**  
**TEMPORARY ENVIRONMENTAL CONTROLS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

7. Sanitary Wastes:

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

**1.2 QUALITY CONTROL**

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

**1.3 REFERENCES**

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

**1.4 SUBMITTALS**

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

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

#### **1.5 PROTECTION OF ENVIRONMENTAL RESOURCES**

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Resident Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.

1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
  - a. Box and protect from damage existing trees and shrubs to remain on the construction site.
  - b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
  - c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
  - a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 10 year storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
  - b. Reuse or conserve the collected topsoil sediment as directed by the Resident Engineer. Topsoil use and requirements are specified in Section 31 20 11, EARTH MOVING (Short Form).
  - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that



- water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features shown. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
6. Manage and control spoil areas on Government property to limit spoil to areas shown and prevent erosion of soil or sediment from entering nearby water courses or lakes.
  7. Protect adjacent areas from despoilment by temporary excavations and embankments.
  8. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
  9. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
  10. Handle discarded materials other than those included in the solid waste category as directed by the Resident Engineer.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
  2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
  3. Monitor water areas affected by construction.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.

- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of West Virginia and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
  2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
  3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
  4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Resident Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00p.m unless otherwise permitted by local ordinance or the Resident Engineer. Repetitive impact noise on the property shall not exceed the following dB limitations:

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

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS, STATIONARY	80	PNEUMATIC TOOLS	80
PUMPS	75		
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

- b. Use shields or other physical barriers to restrict noise transmission.
- c. Provide soundproof housings or enclosures for noise-producing machinery.
- d. Use efficient silencers on equipment air intakes.
- e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
- f. Line hoppers and storage bins with sound deadening material.
- g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face.

Submit the recorded information to the Resident Engineer noting any problems and the alternatives for mitigating actions.

- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.
- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

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**SECTION 01 58 16**  
**TEMPORARY INTERIOR SIGNAGE**

**PART 1 GENERAL**

**DESCRIPTION**

This section specifies temporary interior signs.

**PART 2 PRODUCTS**

**2.1 TEMPORARY SIGNS**

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

**PART 3 EXECUTION**

**3.1 INSTALLATION**

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

**3.2 LOCATION**

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

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**SECTION 01 74 19**  
**CONSTRUCTION WASTE MANAGEMENT**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

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

### 1.3 QUALITY ASSURANCE

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

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

#### **1.4 TERMINOLOGY**

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



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

#### **1.5 SUBMITTALS**

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

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

#### **1.6 APPLICABLE PUBLICATIONS**

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

#### **1.7 RECORDS**

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

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

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

## **PART 3 - EXECUTION**

### **3.1 COLLECTION**

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

### **3.2 DISPOSAL**

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

### **3.3 REPORT**

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

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## SECTION 01 91 00

### GENERAL COMMISSIONING REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 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 COTR 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 and the COTR.
- B. In this structure, only two contract parties are recognized and communications on contractual issues are strictly limited to VA COTR 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 COTR 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 COTR.
- 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 COTR. 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 COTR 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 COTR to require either an official interpretation of the construction documents or require a modification of the contract documents, the Contracting Officer or COTR will issue an official directive to this effect.
4. All parties to the Commissioning Process shall be individually responsible for alerting the COTR 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 COTR, 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 07 08 00 FACILITY EXTERIOR CLOSURE COMMISSIONING.
- C. Section 21 08 00 COMMISSIONING OF FIRE PROTECTION SYSTEMS.
- D. Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.
- E. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.
- F. Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.

### 1.4 SUMMARY

- A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.
- B. The commissioning activities have been developed to support the VA requirements to meet guidelines for Federal Leadership in Environmental, Energy, and Economic Performance.
- C. The commissioning activities have been developed to support the United States Green Building Council (USGBC) LEED™ rating program and to support delivery of project performance in accordance with the VA requirements developed for the project.
  - 1. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" and the prerequisite of "Fundamental Building Systems Commissioning."
  - 2. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" requirements for the "Enhanced Building System Commissioning" credit.
  - 3. Activities and documentation for the LEED™ section on "Measurement and Verification" requirements for the Measurement and Verification credit.

### 1.5 DEFINITIONS

- A. Architect: Includes Architect identified in the Contract for Construction between the Department of Veterans Affairs and Contractor, plus consultant/design professionals responsible for design of fire suppression, plumbing, HVAC, controls for HVAC systems, electrical, communications, electronic safety and security, as well as other related systems.
- B. CxA: Commissioning Agent.
- C. Commissioning Plan: a document that is an overall plan that outlines the commissioning process, commissioning team responsibilities, schedule for commissioning activities, and commissioning documents.



- D. Commissioning Issue: a condition in the installation or function of a component, piece of equipment or system that affects the system operations, maintenance, and/or repair.
- E. Commissioning Observation: a condition in the installation or function of a component, piece of equipment or system that may not be in compliance with the Contract Documents, or may not be in compliance with the manufacturer's installation instruction, or may not be in compliance with generally accepted industry standards.
- F. Systems Functional Performance Test: a test, or tests, of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Systems Functional Performance Testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not Systems Functional Performance Testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while System Functional Performance Testing is verifying that the system has already been set up properly and is functioning in accordance with the Construction Documents. The Commissioning Agent develops the Systems Functional Performance Test Procedures in a sequential written form, coordinates, witnesses, and documents the actual testing. Systems Functional Performance Testing is performed by the Contractor. Systems Functional Performance Tests are performed after startups, control systems are complete and operational, TAB functions and Pre-Functional Checklists are complete.
- G. System: A system is defined as the entire set of components, equipment, and subsystems 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 component of an entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam

supply, chilled water supply, refrigerant supply, hot water supply, controls and electrical service, etc. Another example of a system which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of the fuel supply, combustion air, controls, steam, feedwater supply, condensate return and other related components.

- H. Pre-Functional Checklist: a list of items provided by the Commissioning Agent to the Contractor that require inspection and elementary component tests conducted to verify proper installation of equipment. Pre-Functional Checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some Pre-Functional Checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The term "Pre-Functional" refers to before Systems Functional Performance Testing. Pre-Functional Checklists augment and are combined with the manufacturer's startup checklist and the Contractor's Quality Control checklists.
- I. Seasonal Functional Performance Testing: a test or tests that are deferred until the system will experience conditions closer to their design conditions.
- J. VA: Includes the Contracting Officer, COTR, or other authorized representative of the Department of Veterans Affairs.
- K. TAB: Testing, Adjusting, and Balancing.

#### **1.6 SYSTEMS TO BE COMMISSIONED**

- A. Commissioning of a system or systems specified for this project is part of the construction process. Documentation and testing of these systems, as well as training of the VA's Operation and Maintenance personnel, is required in cooperation with the VA and the Commissioning Agent.
- B. The following systems will be commissioned as part of this project:
  - 1. Facility exterior closure (Division 7 and Division 8)
    - a. Roofs (flashing & sheet metal, metal roofing, roof specialties, and roof accessories)
    - b. Exterior Insulation and Finish Systems (EIFS)
    - c. Exterior Doors (emergency exit, and service)

- d. Exterior Windows (Aluminum, glazing)
  - e. Louvers and Vents
  - f. Sealants (Caulking, mechanical seals, and wind and vapor barriers)
2. Fire Suppression (Division 21)
- a. Fire Protection System (Wet-pipe fire suppression, Dry-pipe fire suppression).
3. Plumbing (Division 22)
- a. Domestic Hot Water systems (Domestic water heaters, hot water circulating pumps and motors, controls).
  - b. Medical Gas systems (Medical compressed air and oxygen, Medical Gas Alarm System).
  - c. Storm Sump Pumps (Sump level controls, pump alternator, alarms and alarm panel, pumps and motors).
4. HVAC (Division 23)
- a. Air Handling Systems (Fans, motors, Variable Speed Drives, cooling coils and control valves, heating coils and control valves, filters, dampers, safeties such as smoke detectors or freezestats and damper end switches, controls, gages, and vibration isolation).
  - b. Dehumidification Systems (Energy recovery devices - such as enthalpy wheels, fans, motors, Variable Speed Drives, cooling coils and control valves, heating coils and control valves, filters, dampers, safeties, controls, gages, and vibration isolation).
  - c. Exhaust Fans (Fan, motor, Variable Speed Drives, controls and safeties).
  - d. Direct Digital Control System (BACnet or similar Local Area Network (LAN), Operator Work Station hardware and software, building controller hardware and software, terminal unit controller hardware and software, all sequences of operation, system accuracy and response time).
  - e. Computer Room Air Conditioning Systems (CRAC units - including fans, motors, Variable Speed Drives, cooling coils and control valves, heating coils and control valves, humidifiers, compressors and liquid-cooled condensers, filters, safeties, controls, gages, vibration isolation, condensate pumps,

water/leak detection system and alarms, and shunt trip shut down).

- f. Commercial Kitchen Hoods & Associated Fire Suppression Systems (Fans, motors, Variable Speed Drives, automatic shut down on fire suppression discharge, and gas valve operation).
- g. Fuel Delivery and Storage Systems for Boilers and Standby Generators (Fuel level monitoring/controls/alarms, transfer pumps and motors, leak detection monitoring/alarms, and fill systems)

5. Electrical (Division 26)

- a. Utility Service Entrance Switchgear (Fuses and circuit breaker settings, metering, mimic diagram, gages, and controls).
- b. Standby Generator Systems (Automatic transfer switches, fuel delivery pumps and motors, battery charging and instrumentation, muffler and exhaust system, and vibration isolation).
- c. Generator Paralleling Switchboards (Automatic transfer switches, instrumentation, metering and gages, and controls).
- d. Generator Power Distribution Systems (Fuses and circuit breaker settings, metering, gages, and controls).
- e. Utility Power Unit Substations (Transformers and tap settings, fuses and circuit breaker settings, metering, gages, and controls).
- f. Generator Power Unit Substations (Transformers and tap settings, fuses and circuit breaker settings, metering, gages, and controls).
- g. Automatic Transfer Switches (Test with associated generator).
- h. Normal Power Distribution Systems (Grounding tests, coordination study review, major circuit breaker settings, meters and gages, and controls).
- i. Life Safety Power Distribution Systems (Automatic transfer on loss of normal power, grounding tests, coordination study review, major circuit breaker settings, meters and gages, and controls).
- j. Critical Power Distribution Systems (Automatic transfer on loss of normal power, grounding tests, coordination study review, major circuit breaker settings, meters and gages, and controls).
- k. Essential Equipment Power Distribution Systems (Automatic transfer on loss of normal power, grounding tests, coordination study review, major circuit breaker settings, meters and gages, and controls).

1. Lighting Controls (Control system hardware and software, scene settings, zone settings, occupancy sensor interface, and unoccupied cycle control).
- m. Uninterruptible Power Supply Systems and UPS Power Distribution Systems (Battery chargers, static and dynamic power generators - i.e. inverters, MG sets, metering and controls, system power displays, and distribution panel circuit breakers).
6. Communications (Division 27)
  - a. Facility Telecommunications and Data Distribution Systems.
  - b. Nurse Call / Code Blue Systems (Local stations, system hardware and software, reset functions, response time per activation, and notification signals).
  - c. Public Address and Mass Notification Systems (Amplifiers and head-end hardware, speaker volume, and background noise - i.e. hiss or similar interference).
  - d. Healthcare Intercommunications and Program Systems (Local stations, system hardware and software, and notification signals).
7. Electronic Safety and Security (Division 28)
  - a. Fire Detection and Alarm (Master panel and software, addressable units - i.e. pull stations, flow detectors, heat detectors, etc., controls and alarm functions, horns/bells/door releases and other output devices, and fire command center functions - stairwell communications, stairwell pressurization fan start, mechanical systems shutdowns).
  - b. Access Control Systems.
  - c. Intrusion Detection Systems.
  - d. Elopement Prevention System.
  - e. Video Surveillance System.
8. Site Utility Systems (Division 31)
  - a. Sanitary Sewage Lift Stations (Lift station sump or tank level controls, pump alternator, alarms and alarm panel, pumps and motors).
  - b. Storm Drainage Pump Systems (Sump level controls, pump alternator, alarms and alarm panel, pumps and motors).

#### **1.7 COMMISSIONING TEAM**

- A. Members Appointed by Contractor:

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

B. 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. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

**1.8 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.

**1.9 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.

#### **1.10 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.

#### **1.11 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.

#### **1.12 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 COTR 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.

#### **1.13 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 90 days of contract award, the Contractor shall designate a specific individual as the Commissioning Manager (CM) 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 90 days of contract award, the Contractor shall ensure that each subcontractor designates specific individuals as Commissioning Representatives (CR) 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.

#### **1.14 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.

#### **1.15 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 will work with the Commissioning Agent and the VA to incorporate the commissioning activities into the



construction schedule. The Commissioning Agent will provide sufficient information 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 when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

### **PART 3 - EXECUTION**

#### **3.1 STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS**

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

of each procedure and a summary statement with a signature block at the end of the plan.

- b. The full startup plan shall at a minimum consist of the following items:
  - 1) The Pre-Functional Checklists.
  - 2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
  - 3) The manufacturer's normally used field checkout sheets.
    - a) The Commissioning Agent will submit the full startup plan to the VA and Contractor for review. Final approval will be by the VA.
    - b) 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, CO<sub>2</sub> and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 21, Division 22, Division 23, Division 26, Division 27, and Division 28 specifications.
  - b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
- 4. Execution of Equipment Startup
  - a. Four weeks prior to equipment startup, the Contractor shall schedule startup and checkout with the VA and Commissioning Agent. The performance of the startup and checkout shall be directed and executed by the Contractor.
  - b. The Commissioning Agent will observe the startup procedures for selected pieces of primary equipment.
  - c. The Contractor shall execute startup and provide the VA and Commissioning Agent with a signed and dated copy of the completed startup checklists, and contractor tests.
  - d. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed

shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

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

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

### **3.3 PHASED COMMISSIONING**

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

### **3.4 TRENDING AND ALARMS**

- 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 COTR 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 COTR. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the COTR, 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.

Dedicated Outside Air Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
OA Temperature	AI	15 Min	24 hours	3 days	N/A		
OA Humidity	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
EA Temperature	AI	15 Min	24 hours	3 days	N/A		
EA Humidity	AI	15 Min	24 hours	3 days	N/A		
Mixed Air Temp	AI	None	None	None	N/A		
Mixed Air Humidity	AI	None	None	None	N/A		
SA Temp	AI	15 Min	24 hours	3 days	C	±5°F from SP	10 min
SA Humidity	AI	15 Min	24 hours	3 days	P	>90% RH	10 min
1 <sup>st</sup> Floor Humidifier Temp	AI	15 Min	24 hours	3 days	N/A		
1 <sup>st</sup> Fl Supply Humidity	AI	15 Min	24 hours	3 days	P	>90% RH	10 min
2 <sup>nd</sup> Floor Humidifier Temp	AI	15 Min	24 hours	3 days	N/A		
2 <sup>nd</sup> Fl Supply Humidity	AI	15 Min	24 hours	3 days	P	>90% RH	10 min
Supply Fan Speed	AI	15 Min	24 hours	3 days	N/A		
Exhaust Fan Speed	AI	15 Min	24 hours	3 days	N/A		
Enthalpy Wheel Speed	AI	15 Min	24 hours	3 days	N/A		
EA Filter Status	AI	None	None	None	M	> SP	1 hour
OA Filter Status	AI	None	None	None	M	> SP	1 hour
Unit Current Draw	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
Duct Pressure	AI	15 Min	24 hours	3 days	C	±25% from SP	6 min
Supply Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min

Dedicated Outside Air Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Exhaust Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 Min
Enthalpy Wheel 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
Fire/Smoke Damper Status	DI	COV	24 hours	3 days	P	Closed	1 min
Humidifier Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Emergency AHU Shutdown	DI	COV	24 hours	3 days	P	True	1 min
Kitchen Exhaust Fan 513-EF2 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Kitchent Exhaust Fan 513-EF-3 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan 513-EF-4 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
Power Failure	DI	COV	24 hours	3 days	P	True	1 min
Supply Fan Speed	AO	15 Min	24 hours	3 days	N/A		
Exhaust Fan Speed	AO	15 Min	24 hours	3 days	N/A		
Enthalpy Wheel Speed	AO	15 Min	24 hours	3 days	N/A		
Electric Heat Output	AO	15 Min	24 hours	3 days	N/A		
Supply Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Fire/Smoke Dampers	DO	COV	24 hours	3 days	N/A		
Outside Air Damper	DO	COV	24 hours	3 days	N/A		



Dedicated Outside Air Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Exhaust Air Damper	DO	COV	24 hours	3 days	N/A		
Enthalpy Wheel S/S	DO	COV	24 hours	3 days	N/A		
Outside Air Bypass Damper	DO	COV	24 hours	3 days	N/A		
Exhaust Air Bypass Damper	DO	COV	24 hours	3 days	N/A		
Humidifier Enable	DO	COV	24 hours	3 days	N/A		
Kitchen Exhaust Fan 513-EF2 S/S	DO	COV	24 hours	3 days	N/A		
Kitchen Exhaust Fan 513-EF3 S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan 513-EF4 S/S	DO	COV	24 hours	3 days	N/A		
AHU Energy	Calc	1 Hour	30 day	N/A	N/A		

VRF Indoor 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
Filter Status	DI	COV	None	None	M	> SP	1 hour
Fan Speed Setting	DI	COV	12 hours	3 days	M	N/A	30 Min
Unit ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min
Energy	Calc	1 Hour	30 day	N/A	N/A		

VRF System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Unit Current Draw	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Compressor Speed	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Unit Fault	AI	COV	12 hours	3 days	P	<> 0	10 min
Compressor Enabled	DI	COV	12 hours	3 days			
High Refrigerant Pressure	DI	COV	12 hours	3 days	P	> SP	5 Min
Low Refrigerant Pressure	DI	COV	12 hours	3 days	P	< SP	5 Min
Reversing Valve Position	DI	COV	12 hours	3 days			
Unit ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min
Energy	Calc	1 Hour	30 day	N/A	N/A		

Split Air Conditioning 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
Filter Status	AI	None	None	None	M	> SP	1 hour
Unit Current Draw	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Compressor Speed	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Unit Fault	AI	COV	12 hours	3 days	P	<> 0	10 min
Compressor Enabled	DI	COV	12 hours	3 days			
High Refrigerant Pressure	DI	COV	12 hours	3 days	P	> SP	5 Min

Split Air Conditioning Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Low Refrigerant Pressure	DI	COV	12 hours	3 days	P	< SP	5 Min
Unit ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min
Energy	Calc	1 Hour	30 day	N/A	N/A		

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
Unit Heater Status	DI	COV	12 hours	3 days	P	Status <> Command	30 min
Unit Heater ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min
Energy	Calc	1 Hour	30 day	N/A	N/A		

Domestic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Domestic HW Setpoint WH-1	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Setpoint WH-2	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	C	> 135 °F	10 Min
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	P	±5°F from SP	10 Min
Domestic VRF Preheat Temp In	AI	15 Minute	12 Hours	3 days	N/A		
Domestic VRF Preheat Temp Out	AI	15 Minute	12 Hours	3 days	N/A		

Domestic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Dom. Circ. Pump Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
VRF Preheat Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Dom. Circ. Pump Start/Stop	DO	COV	12 Hours	3 days	N/A		
VRF Preheat Enable	DO	COV	12 Hours	3 days	N/A		
Domestic HW Start/Stop	DO	COV	12 Hours	3 days	N/A		

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

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

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

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

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

### 3.5 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

- A. This paragraph applies to Systems Functional Performance Testing of systems for all referenced specification Divisions.
- B. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to the Contract Documents. Systems Functional Performance Testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of noncompliant performance are identified and corrected, thereby improving the operation and functioning of the systems. In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, fire alarm and emergency power) where there is a specified system response. The Contractor shall verify each sequence in the sequences of operation. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.
- C. Development of Systems Functional Performance Test Procedures: Before Systems Functional Performance Test procedures are written, the Contractor shall submit all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements found in the Contract Documents and approved submittals and shop drawings, the Commissioning Agent will develop specific Systems Functional Test Procedures to verify and document proper operation of each piece of equipment and system to be commissioned. The Contractor shall assist the Commissioning Agent in

developing the Systems Functional Performance Test procedures as requested by the Commissioning Agent i.e. by answering questions about equipment, operation, sequences, etc. Prior to execution, the Commissioning Agent will provide a copy of the Systems Functional Performance Test procedures to the VA, the Architect/Engineer, and the Contractor, who shall review the tests for feasibility, safety, equipment and warranty protection.

- D. Purpose of Test Procedures: The purpose of each specific Systems Functional Performance Test is to verify and document compliance with the stated criteria of acceptance given on the test form. Representative test formats and examples are found in the Commissioning Plan for this project. (The Commissioning Plan is issued as a separate document and is available for review.) The test procedure forms developed by the Commissioning Agent will include, but not be limited to, the following information:
1. System and equipment or component name(s)
  2. Equipment location and ID number
  3. Unique test ID number, and reference to unique Pre-Functional Checklists and startup documentation, and ID numbers for the piece of equipment.
  4. Date
  5. Project name
  6. Participating parties
  7. A copy of the specification section describing the test requirements
  8. A copy of the specific sequence of operations or other specified parameters being verified
  9. Formulas used in any calculations
  10. Required pretest field measurements
  11. Instructions for setting up the test.
  12. Special cautions, alarm limits, etc.
  13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
  14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
  15. A section for comments.
  16. Signatures and date block for the Commissioning Agent. A place for the Contractor to initial to signify attendance at the test.

E. Test Methods: Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.

1. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.
2. Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
3. Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
4. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.
5. Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent

actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.

- F. Setup: Each function and test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The Contractor shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pretest condition.
- G. Sampling: No sampling is allowed in completing Pre-Functional Checklists. Sampling is allowed for Systems Functional Performance Test Procedures execution. The Commissioning Agent will determine the sampling rate. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the Commissioning Agent may stop the testing and require the Contractor to perform and document a checkout of the remaining units, prior to continuing with Systems Functional Performance Testing of the remaining units.
- H. Cost of Retesting: The cost associated with expanded sample System Functional Performance Tests shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- I. Coordination and Scheduling: The Contractor shall provide a minimum of 7 days notice to the Commissioning Agent and the VA regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Commissioning Agent will schedule Systems Functional Performance Tests with the Contractor and VA. The Commissioning Agent will witness and document the Systems Functional Performance Testing of systems. The Contractor shall execute the tests in accordance with the Systems Functional Performance Test Procedure.
- J. Testing Prerequisites: In general, Systems Functional Performance Testing will be conducted only after Pre-Functional Checklists have been satisfactorily completed. The control system shall be sufficiently tested and approved by the Commissioning Agent and the VA before it is used to verify performance of other components or systems. The air balancing and water balancing shall be completed before Systems



Functional Performance Testing of air-related or water-related equipment or systems are scheduled. Systems Functional Performance Testing will proceed from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems will be checked.

- K. Problem Solving: The Commissioning Agent will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

### **3.6 DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS**

- A. Documentation: The Commissioning Agent will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the Commissioning Agent for that purpose. Prior to testing, the Commissioning Agent will provide these forms to the VA and the Contractor for review and approval. The Contractor shall include the filled out forms with the O&M manual data.
- B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported to the VA on Commissioning Field Reports and/or the Commissioning Master Issues Log.
1. Corrections of minor items of noncompliance identified may be made during the tests. In such cases, the item of noncompliance and resolution shall be documented on the Systems Functional Test Procedure.
  2. Every effort shall be made to expedite the systems functional Performance Testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Agent shall not be pressured into overlooking noncompliant work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so by direction from the VA.
  3. As the Systems Functional Performance Tests progresses and an item of noncompliance is identified, the Commissioning Agent shall discuss the issue with the Contractor and the VA.
  4. When there is no dispute on an item of noncompliance, and the Contractor accepts responsibility to correct it:
    - a. The Commissioning Agent will document the item of noncompliance and the Contractor's response and/or intentions. The Systems

Functional Performance Test then continues or proceeds to another test or sequence. After the day's work is complete, the Commissioning Agent will submit a Commissioning Field Report to the VA. The Commissioning Agent will also note items of noncompliance and the Contractor's response in the Master Commissioning Issues Log. The Contractor shall correct the item of noncompliance and report completion to the VA and the Commissioning Agent.

- b. The need for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test and the test shall be repeated.
5. If there is a dispute about item of noncompliance, regarding whether it is an item of noncompliance, or who is responsible:
- a. The item of noncompliance shall be documented on the test form with the Contractor's response. The item of noncompliance with the Contractor's response shall also be reported on a Commissioning Field Report and on the Master Commissioning Issues Log.
  - b. Resolutions shall be made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive and acceptance authority is with the Department of Veterans Affairs.
  - c. The Commissioning Agent will document the resolution process.
  - d. Once the interpretation and resolution have been decided, the Contractor shall correct the item of noncompliance, report it to the Commissioning Agent. The requirement for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test. Retesting shall be repeated until satisfactory performance is achieved.
- C. Cost of Retesting: The cost to retest a System Functional Performance Test shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a

difference) of equipment fail to perform in compliance with the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specifications, all identical units may be considered unacceptable by the VA. In such case, the Contractor shall provide the VA with the following:

1. Within one week of notification from the VA, the Contractor shall examine all other identical units making a record of the findings. The findings shall be provided to the VA within two weeks of the original notice.
  2. Within two weeks of the original notification, the Contractor shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
  3. The VA shall determine whether a replacement of all identical units or a repair is acceptable.
  4. Two examples of the proposed solution shall be installed by the Contractor and the VA shall be allowed to test the installations for up to one week, upon which the VA will decide whether to accept the solution.
  5. Upon acceptance, the Contractor shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- E. Approval: The Commissioning Agent will note each satisfactorily demonstrated function on the test form. Formal approval of the Systems Functional Performance Test shall be made later after review by the Commissioning Agent and by the VA. The Commissioning Agent will evaluate each test and report to the VA using a standard form. The VA will give final approval on each test using the same form, and provide signed copies to the Commissioning Agent and the Contractor.

### **3.7 DEFERRED TESTING**

- A. Unforeseen Deferred Systems Functional Performance Tests: If any Systems Functional Performance Test cannot be completed due to the building structure, required occupancy condition or other conditions,

execution of the Systems Functional Performance Testing may be delayed upon approval of the VA. These Systems Functional Performance Tests shall be conducted in the same manner as the seasonal tests as soon as possible. Services of the Contractor to conduct these unforeseen Deferred Systems Functional Performance Tests shall be negotiated between the VA and the Contractor.

- B. Deferred Seasonal Testing: Deferred Seasonal Systems Functional Performance Tests are those that must be deferred until weather conditions are closer to the systems design parameters. The Commissioning Agent will review systems parameters and recommend which Systems Functional Performance Tests should be deferred until weather conditions more closely match systems parameters. The Contractor shall review and comment on the proposed schedule for Deferred Seasonal Testing. The VA will review and approve the schedule for Deferred Seasonal Testing. Deferred Seasonal Systems Functional Performances Tests shall be witnessed and documented by the Commissioning Agent. Deferred Seasonal Systems Functional Performance Tests shall be executed by the Contractor in accordance with these specifications.

### **3.8 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS**

- A. Training Preparation Conference: Before operation and maintenance training, the Commissioning Agent will convene a training preparation conference to include VA's COTR, 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 Videotapes: Submit two copies within seven days of end of each training module.
  - a. Identification: On each copy, provide an applied label with the following information:
    - 1) Name of Project.
    - 2) Name and address of photographer
    - 3) Name of Contractor.
    - 4) Date videotape was recorded.
    - 5) Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
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. 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. Refrigeration systems, including condensers and distribution piping.
  - f. HVAC systems, including air handling equipment, air distribution systems, and terminal equipment and devices.
  - g. Switchgear, transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
  - h. Packaged engine generators, including synchronizing switchgear/switchboards, and transfer switches.
  - i. Lighting equipment and controls.

- j. Communication systems, including intercommunication, surveillance, nurse call systems, public address, mass evacuation, voice and data, and entertainment television equipment.
  - k. 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 portions of buildings, utilities, other structures and debris from trash dumps shown.

**1.2 RELATED WORK:**

- A. Demolition and removal of walks and on-grade slabs outside buildings to be demolished.
- B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- E. Asbestos Removal: Section 02 82 13.19, ASBESTOS ABATEMENT CLASS II MATERIALS.
- F. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- G. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.

**1.3 PROTECTION:**

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.
- C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.
- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.

- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.
- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
  - 1. No wall or part of wall shall be permitted to fall outwardly from structures.
  - 2. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
  - 3. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center; any damaged items shall be repaired or replaced as approved by the COTR. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have COTR's approval.
- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

#### **1.4 UTILITY SERVICES:**

- A. Demolish and remove outside utility service lines shown to be removed.
- B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.
- C. Coordinate demolition work (by separate project) with Sitework Demolition.

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

**PART 3 - EXECUTION**

**3.1 DEMOLITION:**

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

**3.2 CLEAN-UP:**

On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to COTR. Clean-up shall include off the Medical Center disposal of all items and materials not

required to remain property of the Government as well as all debris and rubbish resulting from demolition operations.

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**SECTION 02 82 13.19**  
**ASBESTOS ABATEMENT CLASS II MATERIALS**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF THE WORK**

#### **1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS**

Drawings, general provisions of the contract, including general and supplementary conditions and other Division 01 specifications, shall apply to the work of this section. The contract documents show the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Asbestos Abatement Contractor (Contractor) discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the Contracting Officer for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor without obtaining guidance from the Contracting Officer shall become the sole risk and responsibility of the Contractor. All cost incurred due to such action are also the responsibility of the Contractor.

#### **1.1.2 EXTENT OF WORK**

- A. Below is a brief description of the asbestos materials to be abated. These materials were determined to be asbestos from a previous survey report provided by the Owner. This report is available for review. It is the Contractor's responsibility to determine the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.
- B. Removal, clean-up and disposal of ACM in an appropriate regulated area. (192) square feet of exterior transite panels found on the ground floor of Bldg 501C. Specific location can be obtained from the drawing.

#### **1.1.3 RELATED WORK**

- A. Section 07 84 00, FIRESTOPPING.
- B. Section 02 41 00, DEMOLITION.
- C. Division 09; FINISHES.

#### **1.1.4 TASKS**

The work tasks are summarized briefly as follows:

- A. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, work-site preparations, emergency procedures arrangements, and standard operating procedures for Class II asbestos abatement work.
- B. Abatement activities including removal, clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.
- C. Cleaning and decontamination activities including final visual inspection, air monitoring and certification of decontamination.

#### **1.1.5 ABATEMENT CONTRACTOR USE OF PREMISES**

- A. The Contractor and Contractor's personnel shall cooperate fully with the VA representative/consultant to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the VA specifications, drawings, phasing plan and in compliance with any/all applicable Federal, State and Local regulations and requirements.
- B. The Contractor shall use the existing facilities in the building strictly within the limits indicated in contract documents as well as the approved pre-abatement work plan. Asbestos abatement drawings of partially occupied buildings will show the limits of regulated areas; the placement of decontamination facilities; the temporary location of bagged waste ACM; the path of transport to outside the building; and the temporary waste storage area for each building/regulated area. Any variation from the arrangements shown on drawings shall be secured in writing from the VA representative through the pre-abatement plan of action. The following limitations of use shall apply to existing facilities shown on drawings:

#### **1.2 VARIATIONS IN QUANTITY**

The quantities and locations of ACM as indicated on the drawings and the extent of work included in this section are estimates which are limited by the physical constraints imposed by occupancy of the buildings. Accordingly, minor variations (+/- 25%) in quantities of ACM within the regulated area are considered as having no impact on contract price and time requirements of this contract. Where additional work is required beyond the above variation, the Contractor shall provide unit prices for additional work that is newly discovered

materials and those prices will be used for additional work under the contract.

### **1.3 STOP ASBESTOS REMOVAL**

If the Contracting Officer or their field representative presents a written **Stop Asbestos Removal Order**, the Contractor/Personnel shall immediately stop all asbestos removal and adequately wet any exposed ACM. The Contractor shall not resume any asbestos removal activity until authorized to do so by the VA. A stop asbestos removal order may be issued at any time the VA determines abatement conditions/activities are not within specification requirements. Work stoppage will continue until conditions have been corrected to the satisfaction of the VA. Standby time and costs for corrective actions will be borne by the Contractor, including the industrial hygienist's time. The occurrence of any of the following events shall be reported immediately by the Contractor in writing to the VA representative and shall require the Contractor to immediately stop asbestos removal activities and initiate fiber reduction activities:

- A.  $\geq 0.01$  f/cc outside a regulated area or  $>0.05$  f/cc inside a regulated area;
- B. breach/break in regulated area critical barrier(s)/floor;
- C. serious injury/death at the site;
- D. fire/safety emergency at the site;
- E. respiratory protection system failure;
- F. power failure loss of wetting agent; or
- G. any visible emissions observed outside the regulated area.

### **1.4 DEFINITIONS**

#### **1.4.1 GENERAL**

Definitions and explanations here are neither complete nor exclusive of all terms used in the contract documents, but are general for the work to the extent they are not stated more explicitly in another element of the contract documents. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated therein.

#### **1.4.2 GLOSSARY**

**Abatement** - Procedures to control fiber release from asbestos-containing materials, typically during removal. Includes removal,

encapsulation, enclosure, demolition and renovation activities related to asbestos.

**ACE** - Asbestos contaminated elements.

**ACM** - Asbestos containing material.

**Aerosol** - Solid or liquid particulate suspended in air.

**Adequately wet** - Sufficiently mixed or penetrated with liquid to prevent the release of particulates. If visible emissions are observed coming from the ACM, then that material has not been adequately wetted.

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

**Aggressive sampling** - EPA AHERA defined clearance sampling method using air moving equipment such as fans and leaf blowers to aggressively disturb and maintain in the air residual fibers after abatement.

**AHERA** - Asbestos Hazard Emergency Response Act. Asbestos regulations for schools issued in 1987.

**Aircell** - Pipe or duct insulation made of corrugated cardboard which contains asbestos.

**Air monitoring** - The process of measuring the fiber content of a known volume of air collected over a specified period of time. The NIOSH 7400 Method, Issue 2 is used to determine the fiber levels in air.

**Air sample filter** - The filter used to collect fibers which are then counted. The filter is made of mixed cellulose ester membrane for PCM (Phase Contrast Microscopy) and polycarbonate for TEM (Transmission Electron Microscopy)

**Amended water** - Water to which a surfactant (wetting agent) has been added to increase the penetrating ability of the liquid.

**Asbestos** - Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered. Asbestos also includes PACM, as defined below.

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

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

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

**Asbestos waste decontamination facility** - A system consisting of drum/bag washing facilities and a temporary storage area for cleaned containers of asbestos waste. Used as the exit for waste and equipment leaving the regulated area. In an emergency, it may be used to evacuate personnel.

**Authorized person** - Any person authorized by the VA, the Contractor, or government agency and required by work duties to be present in regulated areas.

**Authorized visitor** - Any person approved by the VA; the contractor; or any government agency having jurisdiction over the regulated area.

**Barrier** - Any surface that isolates the regulated area and inhibits fiber migration from the regulated area.

**Containment Barrier** - An airtight barrier consisting of walls, floors, and/or ceilings of sealed plastic sheeting which surrounds and seals the outer perimeter of the regulated area.

**Critical Barrier** - The barrier responsible for isolating the regulated area from adjacent spaces, typically constructed of plastic sheeting secured in place at openings such as doors, windows, or any other opening into the regulated area.

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

**Secondary Barrier** - Any additional sheeting used to isolate and provide protection from debris during abatement work.

**Breathing zone** - The hemisphere forward of the shoulders with a radius of about 150 - 225 mm (6 - 9 inches) from the worker's nose.

**Bridging encapsulant** - An encapsulant that forms a layer on the surface of the ACM.

**Building/facility owner** - The legal entity, including a lessee, which exercises control over management and recordkeeping functions relating to a building and/or facility in which asbestos activities take place.

**Bulk testing** - The collection and analysis of suspect asbestos containing materials.

**Certified Industrial Hygienist (CIH)** - One certified in practice of industrial hygiene by the American Board of Industrial Hygiene. An industrial hygienist Certified in Comprehensive Practice by the American Board of Industrial Hygiene.

**Class I asbestos work** - Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and Presumed Asbestos Containing Material (PACM).

**Class II asbestos work** - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.

**Clean room/Changing room** - An uncontaminated room having facilities for the storage of employee's street clothing and uncontaminated materials and equipment.

**Clearance sample** - The final air sample taken after all asbestos work has been done and visually inspected.

Performed by the VA's industrial hygiene consultant (VPIH).

**Closely resemble** - The major workplace conditions which have contributed to the levels of historic asbestos exposure, are no more protective than conditions of the current workplace.

**Competent person** - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f); in addition, for Class I and II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor.

**Contractor's Professional Industrial Hygienist (CPIH)** - The Contractor's industrial hygienist. The industrial hygienist must meet the qualification requirements of the PIH.

**Count** - Refers to the fiber count or the average number of fibers greater than five microns in length per cubic centimeter of air.

**Decontamination area/unit** - An enclosed area adjacent to and connected to the regulated area and consisting of an equipment room, shower room, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

**Demolition** - The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.



**Disposal bag** - Typically 6 mil thick siftproof, dustproof, leaktight container used to package and transport asbestos waste from regulated areas to the approved landfill. Each bag/container must be labeled/marked in accordance with EPA, OSHA and DOT requirements.

**Disturbance** - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or disposal bag which shall not exceed 60 inches in length or width.

**Drum** - A rigid, impermeable container made of cardboard fiber, plastic, or metal which can be sealed in order to be siftproof, dustproof, and leaktight.

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

**Encapsulant** - A material that surrounds or embeds asbestos fibers in an adhesive matrix and prevents the release of fibers.

**Encapsulation** - Treating ACM with an encapsulant.

**Enclosure** - The construction of an air tight, impermeable, permanent barrier around ACM to control the release of asbestos fibers from the material and also eliminate access to the material.

**Equipment room** - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

**Fiber** - A particulate form of asbestos, 5 microns or longer, with a length to width ratio of at least 3 to 1.

**Fibers per cubic centimeter (f/cc)** - Abbreviation for fibers per cubic centimeter, used to describe the level of asbestos fibers in air.

**Filter** - Media used in respirators, vacuums, or other machines to remove particulate from air.

**Firestopping** - Material used to close the open parts of a structure in order to prevent a fire from spreading.

**Friable asbestos containing material** - Any material containing more than 1 percent asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR 763, Section 1, Polarized Light Microscopy, that,

when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

**Glovebag** - Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which materials and tools may be handled.

**High efficiency particulate air (HEPA) filter** - A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 microns or greater in diameter.

**HEPA vacuum** - Vacuum collection equipment equipped with a HEPA filter system capable of collecting and retaining asbestos fibers.

**Homogeneous area** - An area of surfacing, thermal system insulation or miscellaneous ACM that is uniform in color, texture and date of application.

**HVAC** - Heating, Ventilation and Air Conditioning

**Industrial hygienist** - A professional qualified by education, training, and experience to anticipate, recognize, evaluate and develop controls for occupational health hazards. Meets definition requirements of the American Industrial Hygiene Association (AIHA).

**Industrial hygienist technician** - A person working under the direction of an IH or CIH who has special training, experience, certifications and licenses required for the industrial hygiene work assigned.

**Intact** - The ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

**Lockdown** - Applying encapsulant, after a final visual inspection, on all abated surfaces at the conclusion of ACM removal prior to removal of critical barriers.

**National Emission Standards for Hazardous Air Pollutants (NESHAP's)** - EPA's rule to control emissions of asbestos to the environment.

**Negative initial exposure assessment** - A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PEL's.

**Negative pressure** - Air pressure which is lower than the surrounding area, created by exhausting air from a sealed regulated area through HEPA equipped filtration units. OSHA requires maintaining -0.02" water gauge inside the negative pressure enclosure.

**Negative pressure respirator** - A respirator in which the air pressure inside the facepiece is negative during inhalation relative to the air outside the respirator.

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

**Organic vapor cartridge** - The type of cartridge used on air purifying respirators for organic vapor exposures.

**Outside air** - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open ferry dock.

**Owner/operator** - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

**Penetrating encapsulant** - Encapsulant that is absorbed into the ACM matrix without leaving a surface layer.

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

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

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

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

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

**Presumed ACM (PACM)** - Thermal system insulation, surfacing, and flooring material installed in buildings prior to 1981. If the building owner has actual knowledge, or should have known through the exercise of due diligence that other materials are ACM, they too must be treated as PACM. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101

(k) (5) .

**Professional IH** - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29 CFR 1926.1101 (b); has completed two specialized EPA approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH.

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

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

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

**Quantitative fit test (QNFT)** - A fit test using a challenge material which is quantified outside and inside the respirator thus allowing the determination of the actual fit factor.

**Regulated area** - An area established by the employer to demarcate where Class I, II, III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed the PEL.

**Regulated ACM (RACM)** - Friable ACM; Category I nonfriable ACM that has become friable; Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or; Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of the demolition or renovation operation.

**Removal** - All operations where ACM, PACM and/or RACM is taken out or stripped from structures or substrates, including demolition operations.

**Renovation** - Altering a facility or one or more facility components in any way, including the stripping or removal of asbestos from a facility component which does not involve demolition activity.

**Repair** - Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

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

**Standard operating procedures (SOP's)** - Asbestos work procedures required to be submitted by the contractor before work begins.

**Supplied air respirator (SAR)** - A respirator that utilizes an air supply separate from the air in the regulated area.

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

**Surfactant** - A chemical added to water to decrease water's surface tension thus making it more penetrating into ACM.

**Thermal system ACM** - A material containing more than 1 percent asbestos applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.

**Transmission electron microscopy (TEM)** - A microscopy method that can identify and count asbestos fibers.

**VA Industrial Hygienist (VPIH/CIH)** - Department of Veterans Affairs Professional Industrial Hygienist.

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

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

**Waste/Equipment decontamination area (W/EDA)** - The area in which waste is packaged and equipment is decontaminated before removal from the regulated area.

**Waste generator** - Any owner or operator whose act or process produces asbestos-containing waste material.

**Waste shipment record** - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

**Wet cleaning** - The process of thoroughly eliminating, by wet methods, any asbestos contamination from surfaces or objects.

#### **1.4.3 REFERENCED STANDARDS ORGANIZATIONS**

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

- A. VA Department of Veterans Affairs  
810 Vermont Avenue, NW  
Washington, DC 20420
- B. AIHA American Industrial Hygiene Association  
2700 Prosperity Avenue, Suite 250  
Fairfax, VA 22031  
703-849-8888
- C. ANSI American National Standards Institute  
1430 Broadway  
New York, NY 10018  
212-354-3300
- D. ASTM American Society for Testing and Materials  
1916 Race St.  
Philadelphia, PA 19103  
215-299-5400
- E. CFR Code of Federal Regulations  
Government Printing Office  
Washington, DC 20420
- F. CGA Compressed Gas Association  
1235 Jefferson Davis Highway  
Arlington, VA 22202  
703-979-0900
- G. CS Commercial Standard of the National Institute of Standards and Technology (NIST)  
U. S. Department of Commerce  
Government Printing Office  
Washington, DC 20420
- H. EPA Environmental Protection Agency  
401 M St., SW  
Washington, DC 20460  
202-382-3949

- I. MIL-STD Military Standards/Standardization Division  
Office of the Assistant Secretary of Defense  
Washington, DC 20420
- J. MSHA Mine Safety and Health Administration  
Respiratory Protection Division  
Ballston Tower #3  
Department of Labor  
Arlington, VA 22203  
703-235-1452
- K. NIST National Institute for Standards and Technology  
U. S. Department of Commerce  
Gaithersburg, MD 20234  
301-921-1000
- L. NEC National Electrical Code (by NFPA)
- M. NEMA National Electrical Manufacturer's Association  
2101 L Street, NW  
Washington, DC 20037
- N. NFPA National Fire Protection Association  
1 Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9101  
800-344-3555
- O. NIOSH National Institutes for Occupational Safety and Health  
4676 Columbia Parkway  
Cincinnati, OH 45226  
513-533-8236
- P. OSHA Occupational Safety and Health Administration  
U.S. Department of Labor  
Government Printing Office  
Washington, DC 20402
- Q. UL Underwriters Laboratory  
333 Pfingsten Rd.  
Northbrook, IL 60062  
312-272-8800
- R. USA United States Army  
Army Chemical Corps

Department of Defense  
Washington, DC 20420

## **1.5 APPLICABLE CODES AND REGULATIONS**

### **1.5.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS**

- A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.
- B. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.
- C. Copies of all standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite in the clean change area of the worker decontamination system.

### **1.5.2 CONTRACTOR RESPONSIBILITY**

The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State and Local regulations related to any and all aspects of the abatement project. The Contractor is responsible for providing and maintaining training, accreditations, medical exams, medical records, personal protective equipment as required by applicable Federal, State and Local regulations. The contractor shall hold the VA and VPIH/CIH consultants harmless for any failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental requirement on the part of himself, his employees, or his subcontractors. The contractor will incur all costs of the CPIH, including all sampling/analytical costs to assure compliance with OSHA/EPA/State requirements.

### **1.5.3 FEDERAL REQUIREMENTS**

Federal requirements which govern some aspect of asbestos abatement include, but are not limited to, the following regulations.

- A. Occupational Safety and Health Administration (OSHA)
  - 1. Title 29 CFR 1926.1101 - Construction Standard for Asbestos
  - 2. Title 29 CFR 1910.132 - Personal Protective Equipment



3. Title 29 CFR 1910.134 - Respiratory Protection
  4. Title 29 CFR 1926 - Construction Industry Standards
  5. Title 29 CFR 1910.20 - Access to Employee Exposure and Medical Records
  6. Title 29 CFR 1910.1200 - Hazard Communication
  7. Title 29 CFR 1910.151 - Medical and First Aid
- B. Environmental Protection Agency (EPA)
1. 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
  2. 40 CFR 763.80 - Asbestos Hazard Emergency Response Act (AHERA)
- C. Department of Transportation (DOT)
- Title 49 CFR 100 - 185 - Transportation

#### **1.5.4 STATE REQUIREMENTS**

State requirements that apply to the asbestos abatement work, disposal, clearance, etc., are to be followed.

#### **1.5.5 LOCAL REQUIREMENTS**

If local requirements are more stringent than federal or state standards, the local standards are to be followed.

#### **1.5.6 STANDARDS**

- A. Standards which govern asbestos abatement activities include, but are not limited to, the following:
1. American National Standards Institute (ANSI) Z9.2-79 - Fundamentals Governing the Design and Operation of Local Exhaust Systems Z88.2 - Practices for Respiratory Protection.
  2. Underwriters Laboratories (UL) 586-90 - UL Standard for Safety of HEPA filter Units, 7th Edition.
- B. Standards which govern encapsulation work include, but are not limited to, the following:
1. American Society for Testing and Materials (ASTM)
- C. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
1. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
  2. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
  3. NFPA 101 - Life Safety Code

#### **1.5.7 EPA GUIDANCE DOCUMENTS**

- A. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference. EPA publications can be ordered from (800) 424-9065.
- B. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024
- C. Asbestos Waste Management Guidance EPA 530-SW-85-007
- D. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
- E. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

#### **1.5.8 NOTICES**

- A. State and Local agencies: Send written notification as required by state and local regulations including the local fire department prior to beginning any work on ACM as follows:
- B. Copies of notifications shall be submitted to the VA for the facility's records in the same time frame notification is given to EPA, State, and Local authorities.

#### **1.5.9 PERMITS/LICENSES**

The contractor shall apply for and have all required permits and licenses to perform asbestos abatement work as required by Federal, State, and Local regulations.

#### **1.5.10 POSTING AND FILING OF REGULATIONS**

Maintain two (2) copies of applicable federal, state, and local regulations. Post one copy of each at the regulated area where workers will have daily access to the regulations and keep another copy in the Contractor's office.

#### **1.5.11 VA RESPONSIBILITIES**

Prior to commencement of work:

- A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment and personal possessions to avoid unauthorized access into the regulated area. **Note: Notification of adjacent personnel is required by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.**
- B. Submit to the Contractor results of background air sampling; including location of samples, person who collected the samples, equipment

utilized and method of analysis. During abatement, submit to the Contractor, results of bulk material analysis and air sampling data collected during the course of the abatement. This information shall not release the Contractor from any responsibility for OSHA compliance.

#### **1.5.12 SITE SECURITY**

- A. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, VA employees and representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the clean room of the decontamination unit.
- B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent person shall immediately notify the VA.
- C. A log book shall be maintained in the clean room of the decontamination unit. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.
- D. Access to the regulated area shall be through of a critical barrier doorway. All other access (doors, windows, hallways, etc.) shall be sealed or locked to prevent entry to or exit from the regulated area. The only exceptions for this requirement are the waste/equipment load-out area which shall be sealed except during the removal of containerized asbestos waste from the regulated area, and emergency exits. Emergency exits shall not be locked from the inside, however, they shall be sealed with poly sheeting and taped until needed.
- E. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel. A 24 hour security system shall be provided at the entrance to the regulated area to assure that all entrants are logged in/out and that only authorized personnel are allowed entrance.
- F. The Contractor will have the VA's assistance in notifying adjacent personnel of the presence, location and quantity of ACM in the regulated area and enforcement of restricted access by the VA's employees.
- G. The regulated area shall be locked during non-working hours and secured by VA security guards.

#### **1.5.13 EMERGENCY ACTION PLAN AND ARRANGEMENTS**

- A. An Emergency Action Plan shall be developed by the Contractor prior to commencing abatement activities and shall be agreed to by the Contractor and the VA. The Plan shall meet the requirements of 29 CFR 1910.38 (a); (b).
- B. Emergency procedures shall be in written form and prominently posted and available in the regulated area. Everyone, prior to entering the regulated area, must read and sign these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.
- C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule and layout of regulated area, particularly barriers that may affect response capabilities.
- D. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.
- E. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
  - 1. For non life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
  - 2. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, remove them from the regulated area, and secure proper medical treatment.
- F. Telephone numbers of all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
- G. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3 minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel required to provide first aid/CPR.

H. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification of the standard operating procedures during abatement. Such incidents include, but are not limited to, fire; accident; and power failure. The Contractor shall detail procedures to be followed in the event of an incident assuring that work is stopped and wetting is continued until correction of the problem.

#### **1.5.14 PRE-START MEETING**

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

- A. Proof of Contractor licensing.
- B. Proof the Competent Person is trained and accredited and approved for working in this State. Verification of the experience of the Competent Person shall also be presented.
- C. A list of all workers who will participate in the project, including experience and verification of training and accreditation.
- D. A list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.
- E. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101 (m).
- F. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101 (h) and Appendix C.
- G. A copy of the Contractor's Standard Operating Procedures for Class I Glovebag Asbestos Abatement. In these procedures, the following information must be detailed, specific for this project.
  - 1. Regulated area preparation procedures;
  - 2. Notification requirements procedure of Contractor as required in 29 CFR 1926.1101 (d);
  - 3. and Decontamination procedures for employees;
  - 4. Class II abatement methods/procedures and equipment to be used;
  - 5. Personal protective equipment to be used;

- H. At this meeting the Contractor shall provide all submittals as required.
- I. Procedures for handling, packaging and disposal of asbestos waste.
- J. Emergency Action Plan and Contingency Plan procedures.

#### **1.6 PROJECT COORDINATION**

The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

##### **1.6.1 PERSONNEL**

- A. Administrative and supervisory personnel shall consist of a qualified Competent Person as defined by OSHA in the Construction Standards and the Asbestos Construction Standard; Contractor Professional Industrial Hygienist and Industrial Hygiene Technicians. These employees are the Contractor's representatives responsible for compliance with these specifications and all other applicable requirements.
- B. Non-supervisory personnel shall consist of an adequate number of qualified personnel to meet the schedule requirements of the project. Personnel shall meet required qualifications. Personnel utilized on-site shall be pre-approved by the VA representative. A request for approval shall be submitted for any person to be employed during the project giving the person's name; social security number; qualifications; accreditation card with picture; Certificate of Worker's Acknowledgment; and Affidavit of Medical Surveillance and Respiratory Protection and current Respirator Fit Test.
- C. Minimum qualifications for Contractor and assigned personnel are:
  - 1. The Contractor has conducted within the last three (3) years, three (3) projects of similar complexity and dollar value as this project; has not been cited and penalized for serious violations of asbestos regulations in the past three (3) years; has adequate liability/occurrence insurance for asbestos work; is licensed in applicable states; has adequate and qualified personnel available to complete the work; has comprehensive standard operating procedures for asbestos work; has adequate materials, equipment and supplies to perform the work.
  - 2. The Competent Person has four (4) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity

- as this project; has completed EPA AHERA/OSHA/State/Local training requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection.
3. The Contractor Professional Industrial Hygienist (CPIH) shall have five (5) years of monitoring experience and supervision of asbestos abatement projects; has participated as senior IH on five (5) abatement projects, three (3) of which are similar in size and complexity as this project; has developed at least one complete standard operating procedure for asbestos abatement; has trained abatement personnel for three (3) years; has specialized EPA AHERA/OSHA training in asbestos abatement management, respiratory protection, waste disposal and asbestos inspection; has completed the NIOSH 582 Course, Contractor/Supervisor course; and has appropriate medical/respiratory protection records/documentation.
  4. The Abatement Personnel shall have completed the EPA AHERA/OSHA abatement worker course; have training on the standard operating procedures of the Contractor; has one year of asbestos abatement experience; has applicable medical and respiratory protection documentation; has certificate of training/current refresher and State accreditation/license.

## **1.7 RESPIRATORY PROTECTION**

### **1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM**

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

### **1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR**

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

### **1.7.3 SELECTION AND USE OF RESPIRATORS**

The procedure for the selection and use of respirators must be submitted to the VA as part of the Contractor's qualification. The procedure must be written clearly enough for workers to understand. A copy of the Respiratory Protection Program must be available in the clean room of the decontamination unit for reference by employees or authorized visitors.

### **1.7.4 MINIMUM RESPIRATORY PROTECTION**

Minimum respiratory protection shall be a half face, HEPA filtered, air purifying respirator when fiber levels are maintained consistently at or below 0.1 f/cc. A higher level of respiratory protection may be provided or required, depending on fiber levels. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h); Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

### **1.7.5 MEDICAL WRITTEN OPINION**

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

### **1.7.6 RESPIRATOR FIT TEST**

All personnel wearing respirators shall have a current qualitative/quantitative fit test which was conducted in accordance with 29 CFR 1910.134 (f) and Appendix A. Fit tests shall be done for PAPR's which have been put into a failure mode.

### **1.7.7 RESPIRATOR FIT CHECK**

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

### **1.7.8 MAINTENANCE AND CARE OF RESPIRATORS**

The Respiratory Protection Program Coordinator shall submit evidence and documentation showing compliance with 29 CFR 1910.134 (h) Maintenance and care of respirators.



## **1.8 WORKER PROTECTION**

### **1.8.1 TRAINING OF ABATEMENT PERSONNEL**

Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101 (k) (9) and any additional State/Local requirements. Training must include, at a minimum, the elements listed at 29 CFR 1926.1101 (k) (9) (viii). Training shall have been conducted by a third party, EPA/State approved trainer meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training certificates and current refresher and accreditation proof must be submitted for each person working at the site.

### **1.8.2 MEDICAL EXAMINATIONS**

Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. The physician's written opinion as required by 29 CFR 1926.1101 (m) (4) shall be provided for each person and shall include in the opinion the person has been evaluated for working in a heat stress environment while wearing personal protective equipment and is able to perform the work.

### **1.8.3 PERSONAL PROTECTIVE EQUIPMENT**

Provide whole body clothing, head coverings, foot coverings and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project. Duct tape shall be used to secure all suit sleeves to wrists and to secure foot coverings at the ankle.

### **1.8.4 REGULATED AREA ENTRY PROCEDURE**

Worker protection shall meet the most stringent requirements. The Competent Person shall ensure that each time workers enter the regulated area, they remove ALL street clothes in the clean room of the decontamination unit and put on new disposable coveralls, head coverings, a clean respirator, and then proceed through the shower room to the equipment room where they put on non-disposable required personal protective equipment.

### **1.8.5 DECONTAMINATION PROCEDURE**

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

- A. When exiting the regulated area, remove all disposable PPE and dispose of in a disposal bag provided in the regulated area.
- B. Carefully decontaminate and clean the respirator. Put in a clean container/bag.

#### **1.8.6 REGULATED AREA REQUIREMENTS**

The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for Class I glovebag regulated areas at 29 CFR 1926.1101 (e) are met applicable to Class II work. All personnel in the regulated area shall not be allowed to eat, drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

#### **1.9 DECONTAMINATION FACILITIES:**

##### **1.9.1 DESCRIPTION:**

Provide each regulated area with a fiber drum with a disposal bag in it for personnel waste materials.

**1.9.2 WASTE/EQUIPMENT DECONTAMINATION AREA (W/EDA)** - The Competent Person shall provide a W/EDA for removal of all waste, equipment and contaminated material from the regulated area.

**1.9.3 WASTE/EQUIPMENT DECONTAMINATION PROCEDURES:** Contain all waste in 6 mil poly bags. Clean/decontaminate bags and pass through a double 6 mil flap doorway into another bag or fiber drum. Remove to disposal dumpster/gondola/vehicle. At no time shall unprotected personnel from the clean side be allowed to enter the regulated area.

#### **PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT**

##### **2.1 MATERIALS AND EQUIPMENT**

###### **2.1.1 GENERAL REQUIREMENTS (ALL ABATEMENT PROJECTS)**

Prior to the start of work, the Contractor shall provide and maintain a sufficient quantity of materials and equipment to assure continuous and efficient work throughout the duration of the project. Work shall not start unless the following items have been delivered to the site and the CPIH has submitted verification to the VA's representative to this effect:

- A. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
- B. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or

contamination. Flammable materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated/work area until abatement is completed.

- C. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized place.
- D. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.
- E. Poly sheeting for critical barriers/floors in the regulated area shall be 6 mil.
- F. If required, the method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces.
- G. An adequate number of infra-red heating units, HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements shall be provided. Fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project shall also be provided. All electrically operated hand tools, equipment, electric cords shall be equipped with GFCI protection.
- H. Special protection for objects in the regulated area shall be detailed. (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water, and falling material.)
- I. Impermeable fiberboard drums and disposal bags 2 layers of 6 mil, for asbestos waste shall be pre-printed with labels, markings and address as required by OSHA, EPA and DOT regulations.
- J. The VA shall be provided a copy of the MSDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication. Chlorinated compounds shall not be used with any spray adhesive or other product. Appropriate encapsulant(s) shall be provided.
- K. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(k) (7) shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.

- L. Adequate and appropriate PPE for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a hazard assessment conducted under 29 CFR 1910.132(d).

## **2.2 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA**

### **2.2.1 GENERAL**

- A. Using critical barriers, seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. All horizontal surfaces, as required, in the regulated area must be covered with 2 layers of 6 mil fire retardant poly to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated, immediately stop work and clean up the contamination at no additional cost to the Government. Provide firestopping and identify all fire barrier penetrations due to abatement work as specified in Section 2.2.8; Section 07 92 00, FIRESTOPPING.
- 2.2.2 PREPARATION PRIOR TO SEALING THE REGULATED AREA
- B. Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. Remove all uncontaminated removable furniture, equipment and/or supplies from the regulated area before commencing work, or completely cover with two layers of 6-mil fire retardant poly sheeting and secure with duct tape. Lock out and tag out any HVAC systems in the regulated area.

### **2.2.3 CONTROLLING ACCESS TO THE REGULATED AREA**

Access to the regulated area is allowed only through the personnel decontamination facility (PDF), if required. All other means of access shall be eliminated and OSHA DANGER demarcation signs posted as required by OSHA. If the regulated area is adjacent to or within view of an occupied area, provide a visual barrier of 6 mil opaque fire retardant poly sheeting to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid.

### **2.2.4 CRITICAL BARRIERS**

Completely separate any openings into the regulated area from adjacent areas using fire retardant poly at least 6 mils thick and duct tape. Individually seal with two layers of 6 mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting

fixtures, clocks, doors, windows, convectors, speakers, or any other objects in the regulated area. Heat must be shut off any objects covered with poly.

#### **2.2.5 SECONDARY BARRIERS:**

A loose layer of 6 mil fire retardant poly shall be used as a drop cloth to protect the floor/horizontal surfaces from debris generated during the Class II work, except for floor tile abatement. This layer shall be replaced as needed during the work.

#### **2.2.6 EXTENSION OF THE REGULATED AREA**

If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. If the affected area cannot be added to the regulated area, decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.

#### **2.2.7 FIRESTOPPING:**

- A. Through penetrations caused by cables, cable trays, pipes, sleeves must be firestopped with a fire-rated firestop system providing an air tight seal.
- B. Firestop materials that are not equal to the wall or ceiling penetrated shall be brought to the attention of the VA Representative. The Contractor shall list all areas of penetration, the type of sealant used, and whether or not the location is fire rated. Any discovery of penetrations during abatement shall be brought to the attention of the VA Representative immediately. All walls, floors and ceilings are considered fire rated unless otherwise determined by the VA Representative or Fire Marshall.
- C. Any visible openings whether or not caused by a penetration shall be reported by the Contractor to the VA Representative for a sealant system determination. Firestops shall meet ASTM E814 and UL 1479 requirements for the opening size, penetrant, and fire rating needed.

### **2.3 MONITORING, INSPECTION AND TESTING**

#### **2.3.1 GENERAL**

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

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

- B. The VA will employ an independent industrial hygienist (VPIH/CIH) consultant and/or use its own IH to perform various services on behalf of the VA. The VPIH/CIH will perform the necessary monitoring, inspection, testing, and other support services to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH/CIH consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the VPIH/CIH and their services will be borne by the VA except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Contractor.
- C. If fibers counted by the VPIH/CIH during abatement work inside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed 0.05 f/cc, the Contractor shall stop work. If fiber levels exceed 0.01 f/cc outside the regulated area, the Contractor shall stop work. The Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the VA's representative. Cost for the confirmation of results will be borne by the Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the responsibility of the CPIH with review and approval of the VPIH/CIH. An agreement between the CPIH and the VPIH/CIH shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples, location, collection, quality control on-site, analytical laboratory,

interpretation of results and any follow-up actions. This written agreement shall be co-signed by the IH's and delivered to the VA's representative.

#### **2.3.2 SCOPE OF SERVICES OF THE VPIH/CIH CONSULTANT**

- A. The purpose of the work of the VPIH/CIH is to: assure quality; resolve problems; and prevent the spread of contamination beyond the regulated area. In addition, their work includes performing the final inspection and testing to determine whether the regulated area or building has been adequately decontaminated. All air monitoring is to be done utilizing PCM/TEM. The VPIH/CIH will perform the following tasks:
1. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
  2. Task 2: Perform continuous air monitoring, inspection, and testing outside the regulated area during actual abatement work to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.
  3. Task 3: Perform unannounced visits to spot check overall compliance of work with contract/specifications. These visits may include any inspection, monitoring, and testing inside and outside the regulated area and all aspects of the operation except personnel monitoring.
  4. Task 4: Provide support to the VA representative such as evaluation of submittals from the Contractor, resolution of unforeseen developments, etc.
  5. Task 5: Perform, in the presence of the VA representative, final inspection and testing of a decontaminated regulated area or building at the conclusion of the abatement and clean-up work to certify compliance with all regulations and the VA requirements/specifications.
  6. Task 6: Issue certificate of decontamination for each regulated area or building and project report.
- B. All documentation, inspection results and testing results generated by the VPIH/CIH will be available to the Contractor for information and consideration. The Contractor shall cooperate with and support the VPIH/CIH for efficient and smooth performance of their work.
- C. The monitoring and inspection results of the VPIH/CIH will be used by the VA to issue any Stop Removal orders to the Contractor during

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

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

#### **2.3.3 MONITORING, INSPECTION AND TESTING BY CONTRACTOR CPIH**

The CPIH is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The CPIH is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Contractor's personnel. Safety and health conditions and the provision of those conditions inside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Contractor /Competent Person. The person performing the personnel and area air monitoring inside the regulated area shall be an IH Technician, who shall be trained and shall have specialized field experience in air sampling and analysis. The IH Technician shall have a NIOSH 582 Course or equivalent and show proof. The IH Technician shall participate in the AIHA Asbestos Analysis Registry or participate in the Proficiency Analytic Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA/State Contractor/Supervisor and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples as well as responsibility for documentation. The analytic laboratory used by the Abatement Contractor to analyze the samples shall be AIHA accredited for asbestos PAT. A daily log documenting all OSHA requirements for air monitoring for asbestos in 29 CFR 1926.1101(f), (g) and Appendix A. This log shall be made available to the VA representative and the VPIH/CIH. The log will contain, at a minimum, information on personnel or area sampled, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. The CPIH shall collect and analyze samples for each representative job being done in the regulated area, i.e., removal, wetting, clean-up, and load-out. No fewer than two personal samples per shift shall be collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift in the clean room area shall be collected. In addition to the continuous monitoring



required, the CPIH will perform inspection and testing at the final stages of abatement for each regulated area as specified in the CPIH responsibilities.

#### **2.4 STANDARD OPERATING PROCEDURES**

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

- A. Minimum Personnel Qualifications
- B. Contingency Plans and Arrangements
- C. Security and Safety Procedures
- D. Respiratory Protection/Personal Protective Equipment Program and Training
- E. Medical Surveillance Program and Recordkeeping
- F. Regulated Area Requirements for Class II work
- G. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
- H. Monitoring, Inspections, and Testing
- I. Removal Procedures for Class II Materials
- J. Disposal of ACM Waste
- K. Regulated Area Decontamination/Clean-up
- L. Regulated Area Visual and Air Clearance
- M. Project Completion/Closeout

#### **2.5 SUBMITTALS**

##### **2.5.1 PRE-START MEETING SUBMITTALS**

Submit to the VA a minimum of 14 days prior to the pre-start meeting the following for review and approval. Meeting this requirement is a prerequisite for the pre-start meeting for this project.

- A. Submit a detailed work schedule for the entire project reflecting contract documents and the phasing/schedule requirements from the CPM chart.
- B. Submit a staff organization chart showing all personnel who will be working on the project and their capacity/function. Provide their

qualifications, training, accreditations, and licenses, as appropriate. Provide a copy of the "Certificate of Worker's Acknowledgment" and the "Affidavit of Medical Surveillance and Respiratory Protection" for each person.

- C. Submit Standard Operating Procedures developed specifically for this project, incorporating the requirements of the specifications, prepared, signed and dated by the CPIH.
- D. Submit the specifics of the materials and equipment to be used for this project with brand names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
  - 1. HEPA vacuums, air monitoring pumps, calibration devices, infrared heating machines, and emergency power generating system.
  - 2. Encapsulants, surfactants, hand held sprayers, airless sprayers, fire extinguishers.
  - 3. Personal protective equipment.
  - 4. Fire safety equipment to be used in the regulated area.
- E. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of subcontractor, if used. Proof of asbestos training for transportation personnel shall be provided.
- F. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.
- G. Submit the name, location and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f) and Appendix A.
- H. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
  - 1. Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project:

- Project Name; Type of Abatement; Duration; Cost; Reference  
Name/Phone Number; Final Clearance; Completion Date
2. List of project(s) halted by owner, A/E, IH, regulatory agency in the last 3 years:  
Project Name; Reason; Date; Reference Name/Number; Resolution
  3. List asbestos regulatory citations, penalties, damages paid and legal actions taken against the company in the last 3 years. Provide copies and all information needed for verification.
- I. Submit information on personnel: Provide a resume; address each item completely; provide references; phone numbers; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.20 and that the company has implemented a medical surveillance program and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.
1. CPIH: Name; years of abatement experience; list of projects similar to this one; certificates, licenses, accreditations for proof of AHERA/OSHA specialized asbestos training; professional affiliations; number of workers trained; samples of training materials; samples of SOP's developed; medical opinion; current respirator fit test.
  2. Competent Person(s)/Supervisor(s): Number; names; social security numbers; years of abatement experience as Competent Person/Supervisor; list of similar projects as Competent Person/Supervisor; as a worker; certificates, licenses, accreditations; proof of AHERA/OSHA specialized asbestos training; maximum number of personnel supervised on a project; medical opinion; current respirator fit test.
  3. Workers: Numbers; names; social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion; current respirator fit test.
- J. Submit copies of State license for asbestos abatement; copy of insurance policy, including exclusions with a letter from agent stating in plain english the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of SOP's

incorporating the requirements of this specification; information on who provides your training, how often; who provides medical surveillance, how often; who does and how is air monitoring conducted; a list of references of independent laboratories/IH's familiar with your air monitoring and standard operating procedures; copies of monitoring results of the five referenced projects listed and analytical method(s) used.

- K. When rental equipment is to be used in regulated areas or used to transport asbestos waste, the contractor shall assure complete decontamination of the rental equipment before return to the rental agency.

#### **2.5.2 SUBMITTALS DURING ABATEMENT**

- A. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel entering/exiting the regulated area; document and discuss the resolution of unusual events such as critical barrier breeching, equipment failures, emergencies, and any cause for stopping work; representative air monitoring and results/TWA's/EL's. Submit this daily log to VA's representative.
- B. The CPIH shall document and maintain the following during abatement and submit as appropriate to the VA's representative.
  - 1. Inspection and approval of the regulated area preparation prior to start of work and daily during work.
  - 2. Removal of any poly critical/floor barriers.
  - 3. Visual inspection/testing by the CPIH.
  - 4. Packaging and removal of ACM waste from regulated area.
  - 5. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.

#### **2.5.3 SUBMITTALS AT COMPLETION OF ABATEMENT**

The CPIH shall submit a project report consisting of the daily log book requirements and documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. The report shall include a certificate of completion, signed and dated by the CPIH, in accordance with Attachment #1. The VA Representative will

forward the abatement report to the Medical Center after completion of the project.

### **PART 3 - EXECUTION**

#### **3.1 PRE-ABATEMENT ACTIVITIES**

##### **3.1.1 PRE-ABATEMENT MEETING**

The VA representative, upon receipt, review, and substantial approval of all pre-abatement submittals and verification by the CPIH that all materials and equipment required for the project are on the site, will arrange for a pre-abatement meeting between the Contractor, the CPIH, Competent Person(s), the VA representative(s), and the VPIH/CIH. The purpose of the meeting is to discuss any aspect of the submittals needing clarification or amplification and to discuss any aspect of the project execution and the sequence of the operation. The Contractor shall be prepared to provide any supplemental information/documentation to the VA's representative regarding any submittals, documentation, materials or equipment. Upon satisfactory resolution of any outstanding issues, the VA's representative will issue a written order to proceed to the Contractor. No abatement work of any kind described in the following provisions shall be initiated prior to the VA written order to proceed.

##### **3.1.2 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS**

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

- A. Conduct a space-by-space inspection with an authorized VA representative and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video photography may be used to supplement the written damage inventory. Document will be signed and certified as accurate by both parties.
- B. The VA Representative, the Contractor, and the VPIH/CIH must be aware of 10/95 A/E Quality Alert indicating the failure to identify asbestos as applicable to glovebag abatement in the areas listed. Make sure these areas are looked at/reviewed on the project:  
Lay-in ceilings concealing ACM; ACM behind walls/windows from previous renovations; inside chases/walls; transite piping/ductwork/sheets; behind radiators; below window sills; water/sewer lines; electrical conduit coverings; steam line trench coverings.

- C. Ensure that all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects which the Contractor is required to remove from the regulated area have been cleaned and removed or properly protected from contamination.
- D. Shut down and seal with a minimum of 2 layers of 6 mil fire retardant poly all HVAC systems and critical openings in the regulated area. The regulated area critical barriers shall be completely isolate the regulated area from any other air in the building. The VA's representative will monitor the isolation provision.
- E. Shut down and lock out in accordance with 29 CFR 1910.147 all electrical circuits which pose a potential hazard. Electrical arrangements will be tailored to the particular regulated area and the systems involved. All electrical circuits affected will be turned off at the circuit box outside the regulated area, not just the wall switch. The goal is to eliminate the potential for electrical shock which is a major threat to life in the regulated area due to water use and possible energized circuits. Electrical lines used to power equipment in the regulated area shall conform to all electrical safety standards and shall be isolated by the use of a ground fault circuit interrupter (GFCI). All GFCI shall be tested prior to use. The VA's representative will monitor the electrical shutdown.
- F. If required, remove and dispose of carpeting from floors in the regulated area.
- G. Inspect existing firestopping in the regulated area. Correct as needed.

### **3.1.3 PRE-ABATEMENT CONSTRUCTION AND OPERATIONS**

- A. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.
- B. Upon completion of all preparatory work, the CPIH will inspect the work and systems and will notify the VA's representative when the work is completed in accordance with this specification. The VA's representative may inspect the regulated area and the systems with the VPIH/CIH and may require that upon satisfactory inspection, Contractor's employees perform all major aspects of the approved SOP's, especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory operation.

- C. The CPIH shall document the pre-abatement activities described above and deliver a copy to the VA's representative.
- D. Upon satisfactory inspection of the installation of and operation of systems the VA's representative will notify the Contractor in writing to proceed with the Class II asbestos abatement work in accordance with this specification.

### **3.2 REGULATED AREA PREPARATIONS**

#### **3.2.1 OSHA DANGER SIGNS**

Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted at a distance sufficiently far enough away from the regulated area to permit any personnel to read the sign and take the necessary measures to avoid exposure. Additional signs will be posted following construction of the regulated area enclosure.

#### **3.2.2 SHUT DOWN - LOCK OUT ELECTRICAL**

Shut down and lock out electric power to the regulated area. Provide temporary power and lighting. Insure safe installation including GFCI of temporary power sources and equipment by compliance with all applicable electrical code requirements and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.

#### **3.2.3 SHUT DOWN - LOCK OUT HVAC**

Shut down and lock out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area. Investigate the regulated area and agree on pre-abatement condition with the VA's representative. Seal all intake and exhaust vents in the regulated area with duct tape and 2 layers of 6-mil poly. Also, seal any seams in system components that pass through the regulated area. Remove all contaminated HVAC system filters and place in labeled 6 mil poly disposal bags for disposal as asbestos waste.

#### **3.2.4 SANITARY FACILITIES**

The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.

#### **3.2.5 WATER FOR ABATEMENT**

The VA will provide water for abatement purposes. The Contractor shall connect to the existing VA system. The service to the shower(s) shall be supplied with backflow prevention.

#### **3.2.6 PRE-CLEANING MOVABLE OBJECTS**

Pre-clean all movable objects within the regulated area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects shall be removed from the regulated area and carefully stored in an uncontaminated location.

#### **3.2.7 PRE-CLEANING FIXED OBJECTS**

Pre-clean all fixed objects in the regulated area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate. Careful attention must be paid to machinery behind grills or gratings where access may be difficult but contamination may be significant. Also, pay particular attention to wall, floor and ceiling penetration behind fixed items. After precleaning, enclose fixed objects with 2 layers of 6-mil poly and seal securely in place with duct tape. Objects (e.g., permanent fixtures, shelves, electronic equipment, laboratory tables, sprinklers, alarm systems, closed circuit TV equipment and computer cables) which must remain in the regulated area and that require special ventilation or enclosure requirements should be designated here along with specified means of protection. Contact the manufacturer for special protection requirements.

#### **3.2.8 PRE-CLEANING SURFACES IN THE REGULATED AREA**

Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Do not use any methods that would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not disturb asbestos-containing materials during this pre-cleaning phase.

### **3.3 CONTAINMENT BARRIERS AND COVERINGS FOR THE REGULATED AREA**

#### **3.3.1 GENERAL**

Seal off any openings at the perimeter of the regulated area with critical barriers to completely isolate the regulated area and to contain all airborne asbestos contamination created by the abatement activities. Should the adjacent area past the regulated area become contaminated due to improper work activities, the Contractor shall suspend work inside the regulated area, continue wetting, and clean the adjacent areas in accordance with procedures described in these



specifications. Any and all costs associated with the adjacent area cleanup shall not be borne by the VA.

#### **3.3.2 PREPARATION PRIOR TO SEALING OFF**

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

#### **3.3.3 CONTROLLING ACCESS TO THE REGULATED AREA**

Access to the regulated area shall be permitted only by the competent person. All other means of access shall be closed off by proper sealing and OSHA DANGER demarcation signs posted on the clean side of the regulated area where it is adjacent to or within view of any occupiable area. An opaque visual barrier of 6 mil poly shall be provided so that the abatement work is not visible to any building occupants. If the area adjacent to the regulated area is accessible to the public, construct a solid barrier on the public side of the sheeting for protection and isolation of the project. The barrier shall be constructed with normal 2" x 4" (50mm x 100mm) wood or metal studs 16" (400mm) on centers, securely anchored to prevent movement and covered with a minimum of ½" (12.5mm) plywood. Provide an appropriate number of OSHA DANGER signs for each visual and physical barrier. Any alternative method must be given a written approval by the VA's representative.

#### **3.3.4 CRITICAL BARRIERS**

The regulated area must be completely separated from the adjacent areas, and the outside by at least 2 layers of 6 mil fire retardant poly and duct tape/spray adhesive. Individually seal all supply and exhaust ventilation openings, lighting fixtures, clocks, doorways, windows, convectors, speakers, and other openings into the regulated area with 2 layers of 6 mil fire retardant poly, and taped securely in place with duct tape/spray adhesive. Critical barriers must remain in place until all work and clearances have been completed.

#### **3.3.5 EXTENSION OF THE REGULATED AREA**

If the regulated area barrier is breached in any manner that could allow the passage of asbestos fibers or debris, the Competent Person

shall immediately stop work, continue wetting, and proceed to extend the regulated area to enclose the affected area as per procedures described in this specification. If the affected area cannot be enclosed, decontamination measures and cleanup shall start immediately. All personnel shall be isolated from the affected area until decontamination/cleanup is completed as verified by visual inspection and air monitoring. Air monitoring at completion must indicate background levels or less than 0.01 f/cc.

#### **3.3.6 FLOOR BARRIERS**

If floor removal is not being done, all floors in the regulated area shall be covered with 2 layers of 6 mil fire retardant poly and brought up the wall 12 inches.

### **3.4 REMOVAL OF CLASS II MATERIALS:**

#### **3.4.1 GENERAL**

All applicable requirements of OSHA, EPA, and DOT shall be followed during Class II work. Keep materials intact; do not disturb; wet while working with it; wrap as soon as possible with 2 layers of 6 mil plastic for disposal.

#### **3.4.2 REMOVAL OF TRANSITE:**

- A. All transite must be wetted prior to removal. Unfasten transite panels without disturbance. Keep transite intact.
- B. All waste must be wrapped in two layers of 6 mil poly and lowered carefully to the ground. All waste must be contained in the regulated area.

#### **3.4.3 REMOVAL OF FLOORING MATERIALS:**

- A. All requirements of OSHA Flooring agreement provisions shall be followed:
  - 1. Negative air machine shall be used to effect some negative pressure in the regulated area. A spare machine shall be available.
  - 2. Flooring shall be removed intact, as much as possible. Do not rip or tear flooring.
  - 3. Mechanical chipping or sanding is not allowed.
  - 4. Flooring shall be removed with an infra-red heating unit operated by trained personnel following the manufacturer's instructions.
  - 5. Wet clean and HEPA vacuum the floor before and after removal of flooring.

6. Place a 6 mil poly layer 4' by 10' adjacent to the regulated area for use as a decontaminated area. All waste must be contained in the regulated area.
7. Package all waste in 6 mil poly lined fiberboard drums.

#### **3.4.4 REMOVAL OF MASTIC**

- A. Mastic removal material must have a flash point above 140°F.
- B. The mastic removal material must be a "low odor" or "no odor" material.
- C. A negative air machine as required under flooring removal shall be provided.
- D. Follow all manufacturers' instructions in the use of the mastic removal material.
- E. Package all waste in 6 mil poly lined fiberboard drums.
- F. Prior to application of any liquid material, check the floor for penetrations and seal before removing mastic.

#### **3.5 DISPOSAL OF CLASS II WASTE MATERIAL:**

##### **3.5.1 GENERAL**

Package and dispose of waste materials as per this specification. All OSHA, EPA, and DOT requirements must be met. Landfill requirements for packaging must also be met. Disposal of non-friable waste must be done in accordance with applicable regulations.

#### **3.6 PROJECT DECONTAMINATION**

##### **3.6.1 GENERAL**

- A. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH.
- B. If the asbestos abatement work is in an area which was contaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal and cleaning of the regulated area surfaces after the primary barrier removal.
- C. If the asbestos abatement work is in an area which was uncontaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

##### **3.6.2 REGULATED AREA CLEARANCE**

Air testing and other requirements which must be met before release of the Contractor and re-occupancy of the regulated area space are specified in Final Testing Procedures.

### **3.6.3 WORK DESCRIPTION**

Decontamination includes the cleaning and clearance of the air in the regulated area and the decontamination and removal of the enclosures/facilities installed prior to the abatement work including primary/critical barriers, PDF and W/EDF facilities.

### **3.6.4 PRE-DECONTAMINATION CONDITIONS**

- A. Before decontamination starts, all ACM waste from the regulated area shall be removed, all waste collected and removed, and the secondary barrier of poly removal and disposed of along with any gross debris generated by the work.
- B. At the start of decontamination, the following shall be in place:
  - 1. Critical barriers over all openings consisting of two layers of 6 mil poly which is the sole barrier between the regulated area and the rest of the building or outside.
  - 2. Decontamination facilities, if required for personnel and equipment in operating condition.

### **3.6.5. CLEANING:**

Clean all surfaces of the regulated area by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping methods. If determined by the CPIH/VPIH/CIH additional cleaning(s) may be needed.

## **3.7 VISUAL INSPECTION AND AIR CLEARANCE TESTING**

### **3.7.1 GENERAL**

Notify the VA representative 24 hours in advance for the performance of the final visual inspection and testing. The final visual inspection and testing will be performed by the VPIH/CIH after the cleaning.

### **3.7.2 VISUAL INSPECTION**

Final visual inspection will include the entire regulated area, all poly sheeting, seals over HVAC openings, doorways, windows, and any other openings. If any debris, residue, dust or any other suspect material is detected, the cleaning shall be repeated at no cost to the VA. Dust/ material samples may be collected and analyzed at no cost to the VA at the discretion of the VPIH/CIH to confirm visual findings. When the regulated area is visually clean the final testing can be done.

### **3.7.3 AIR CLEARANCE TESTING**

- A. After an acceptable final visual inspection by the VPIH/CIH and VA Representative, the VPIH/CIH will perform the final testing. Air

samples will be collected and analyzed in accordance with procedures for PCM in this specification. If the release criteria are not met, the Contractor shall repeat the final cleaning and continue decontamination procedures. Additional inspection and testing will be done at the expense of the Contractor.

- B. If the results of the PCM are acceptable, remove the critical barriers. Any small quantities of residue material found upon removal of the poly shall be removed with a HEPA vacuum and localized isolation. If significant quantities are found as determined by the VPIH/CIH, then the entire area affected shall be cleaned as specified in the final cleaning.
- C. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

#### **3.7.4 FINAL AIR CLEARANCE PROCEDURES**

- A. Contractor's Release Criteria: Work in a regulated area is complete when the regulated area is visually clean and airborne fiber levels have been reduced to or below 0.01 f/cc as measured with PCM methods.
- B. Air Monitoring and Final Clearance Sampling: To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to the specified level, the VPIH/CIH will secure samples and analyze them according to the following procedures:
  - 1. Fibers Counted: "Fibers" referred to in this section shall be either all fibers regardless of composition as counted in the NIOSH 7400 PCM method.
  - 2. All clearance air testing samples shall be collected on 0.8 $\mu$  MCE filters for PCM analysis. Air samples will be collected in areas subject to normal air circulation. A minimum of 5 PCM samples will be collected with at least 1200 Liters of air sampled. All results must be less than 0.01 f/cc for clearance.

### **3.8 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE**

#### **3.8.1 COMPLETION OF ABATEMENT WORK**

- A. After thorough decontamination, complete asbestos abatement work upon meeting the regulated area clearance criteria and fulfilling the following:
  - 1. Remove all equipment, materials, and debris from the project area.
  - 2. Package and dispose of all asbestos waste as required.

3. Repair or replace all interior finishes damaged during the abatement work.
4. Fulfill other project closeout requirements as specified elsewhere in this specification.

#### **3.8.2 CERTIFICATE OF COMPLETION BY CONTRACTOR**

The CPIH shall complete and sign the "Certificate of Completion" in accordance with Attachment 1 at the completion of the abatement and decontamination of the regulated area.

#### **3.8.3 WORK SHIFTS**

All work shall be done during administrative hours (8:00 AM to 4:30 PM) Monday - Friday excluding Federal Holidays. Any change in the work schedule must be approved in writing by the VA Representative.

**ATTACHMENT #1**

**CERTIFICATE OF COMPLETION**

DATE:

PROJECT NAME:

VAMC/ADDRESS:

1. I certify that I have personally inspected, monitored and supervised the abatement work of (specify regulated area or Building):  
which took place from            /            /            to            /            /
2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.
3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.
4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.
5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.
6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum fiber count never exceeded 0.5 f/cc, except as described below.
7. That all glovebag work was done in accordance with OSHA requirements and the manufacturer's recommendations.

CPIH Name:

Signature/Date:

Asbestos Abatement Contractor's Name:

Signature/Date:

**ATTACHMENT #2**

**CERTIFICATE OF WORKER'S ACKNOWLEDGMENT**

PROJECT NAME:

DATE:

PROJECT ADDRESS:

ABATEMENT CONTRACTOR'S NAME:

**WORKING WITH ASBESTOS CAN BE HAZARDOUS TO YOUR HEALTH. INHALING ASBESTOS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCERS. IF YOU SMOKE AND INHALE ASBESTOS FIBERS YOUR CHANCES OF DEVELOPING LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.**

Your employer's contract with the owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of the equipment found at an asbestos abatement project. You must receive/have a current medical examination for working with asbestos. These things shall be provided at no cost to you. By signing this certificate you are indicating to the owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by a third party, State/EPA accredited trainer in the requirements for an AHERA/OSHA Asbestos Abatement Worker training course, 32 hours minimum duration. I currently have a valid State accreditation certificate. The topics covered in the course include, as a minimum, the following:

- Physical Characteristics and Background Information on Asbestos
- Potential Health Effects Related to Exposure to Asbestos
- Employee Personal Protective Equipment
- Establishment of a Respiratory Protection Program
- State of the Art Work Practices
- Personal Hygiene
- Additional Safety Hazards
- Medical Monitoring
- Air Monitoring
- Relevant Federal, State and Local Regulatory Requirements, Procedures, and Standards
- Asbestos Waste Disposal

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, occupational history, pulmonary function test, and may have included a chest x-ray evaluation. The physician issued a positive written opinion after the examination.

Signature:

Printed Name:

Social Security Number:

Witness:



**ATTACHMENT #3**

**AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND  
TRAINING/ACCREDITATION**

VA PROJECT NAME AND NUMBER:

VA MEDICAL FACILITY:

ABATEMENT CONTRACTOR'S NAME AND ADDRESS:

1. I verify that the following individual

Name: Social Security Number:

who is proposed to be employed in asbestos abatement work associated with the above project by the named Abatement Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.1101(m), and that complete records of the medical surveillance program as required by 29 CFR 1926.1101(m)(n) and 29 CFR 1910.20 are kept at the offices of the Abatement Contractor at the following address.

Address:

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.
3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.
4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH:

Date:

Printed Name of CPIH:

Signature of Contractor:

Date:

Printed Name of Contractor:

**ATTACHMENT #4**

**ABATEMENT CONTRACTOR/COMPETENT PERSON(S) REVIEW AND ACCEPTANCE OF THE VA'S  
ASBESTOS SPECIFICATIONS**

VA Project Location:

VA Project #:

VA Project Description:

This form shall be signed by the Asbestos Abatement Contractor Owner and the Asbestos Abatement Contractor's Competent Person(s) prior to any start of work at the VA related to this Specification. If the Asbestos Abatement Contractor's/Competent Person(s) has not signed this form, they shall not be allowed to work on-site.

I, the undersigned, have read VA's Asbestos Specification regarding the asbestos abatement requirements. I understand the requirements of the VA's Asbestos Specification and agree to follow these requirements as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the VA's Asbestos Specification and have been given an opportunity to ask any questions regarding the content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of the VA's Asbestos Specification.

At the conclusion of the asbestos abatement, I will certify that all asbestos abatement work was done in accordance with the VA's Asbestos Specification and all ACM was removed properly and no fibrous residue remains on any abated surfaces.

Abatement Contractor Owner's Signature

Date

Abatement Contractor Competent Person(s)

Date

Date

Date

- - - END- - -

**SECTION 02 82 13.41  
ASBESTOS ABATEMENT FOR SELECTIVE DEMOLITION PROJECTS**

**SECTION 02 82 13.41  
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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF THE WORK**

#### **1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS:**

Drawings, general provisions of the contract, including general and supplementary conditions, Asbestos Abatement, Demolition, Accident Prevention (FAR 52.236-13) and other Division 01, GENERAL REQUIREMENTS specifications, shall apply to the work of this section. Prevailing wage requirements pursuant to the Davis-Bacon Act shall apply to this work. The contract documents show the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, coordination with other work and the phasing of the work. In the event the Abatement Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the Contracting Officer for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply.

Any actions taken by the Abatement Contractor without obtaining guidance from the Contracting Officer shall become the sole risk and responsibility of the Abatement Contractor.

#### **1.1.2 EXTENT OF WORK:**

- A. The work will consist of asbestos abatement in 1 area of the existing hospital campus, as indicated by the scope of work. RACM discovered during selective demolition is also within the scope of this specification. The extent of the abatement is for informational purposes only and is based on the best information available at the time of the specification preparation. The Abatement Contractor shall satisfy themselves as to the extent of the work. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.
- B. Removal, clean-up and disposal of regulated asbestos containing materials (RACM) and asbestos contaminated elements shall be conducted in approved regulated areas in all areas prior to the beginning of demolition. Any RACM discovered during demolition activity shall be cause for stopping the work. The Demolition Contractor's personnel shall attend an on-site training session related to the types of asbestos at the site and shall not disturb the ACM if found during their work.

No abatement work shall begin in any area unless the Abatement Contractor/Competent Person/VA Representative agreed that all asbestos work requirements as stipulated in the specification have been met. Attachment #4 must be filled out for each abatement area.

1. Asbestos occurs in the existing exterior fascia panels of **Building 501C**, which is to be selectively demolished for the attachment of the new link to new **Building 513**.
2. Asbestos may also occur at the **Building 501C**, First floor, entrance area, where the new connecting corridor meets the existing hospital building.

#### **1.1.3 RELATED WORK:**

- A. Section 02 41 00, DEMOLITION.
- B. Section 02 82 13.19, ASBESTOS ABATEMENT CLASS II MATERIALS

#### **1.1.4 TASKS:**

The work tasks are summarized briefly as follows:

- A. Asbestos abatement of RACM as required by EPA NESHAP's prior to demolition. An EPA/State certified Project Designer must provide a site-specific specification for the asbestos abatement.
- B. Asbestos abatement and clean-up of the asbestos containing debris as indicated in the scope of work. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, work-site preparation/isolation, accident prevention, emergency procedures arrangements, and standard operating procedures for asbestos abatement work.
- C. Demolition activities including demolition, clean-up and disposal of building materials, record keeping, security, monitoring, and inspections conducted in accordance with all applicable laws and this specification. A Demolition Plan, developed by a Professional Engineer, meeting the requirements of 29 CFR 1926.850(a) must be provided.

#### **1.1.5 ABATEMENT CONTRACTOR USE OF PREMISES:**

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



writing from the VA representative through the pre-abatement plan of action.

## **1.2 STOP ABATEMENT ORDER:**

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

## **1.3 DEFINITIONS:**

### **1.3.1 GENERAL**

Definitions and explanations here are neither complete nor exclusive of all terms used in the contract documents, but are general for the work to the extent they are not stated more explicitly in another element of the contract documents. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated therein.

### 1.3.2 GLOSSARY:

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

**ACE** - Asbestos contaminated elements in excess of 1%.

**ACM** - Asbestos containing material in excess of 1%.

**Adequately wet** - Sufficiently mixed or penetrated with liquid to prevent the release of particulates. If visible emissions are observed coming from the ACM, then that material has not been adequately wetted.

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

**Aggressive sampling** - EPA AHERA defined clearance sampling method using air moving equipment such as fans and leaf blowers to aggressively disturb and maintain in the air residual fibers after abatement.

**AHERA** - Asbestos Hazard Emergency Response Act. Regulations implementing this statute were issued in 1987.

**Aircell** - Pipe or duct insulation made of corrugated cardboard which contains asbestos.

**Air monitoring** - The process of measuring the fiber content of a known volume of air collected over a specified period of time. The NIOSH 7400 Method, Issue 2 is used to determine the fiber levels in air.

**Air sample filter** - The filter used to collect fibers that are then counted. The filter is made of mixed cellulose ester membrane for PCM (Phase Contrast Microscopy) and polycarbonate for TEM (Transmission Electron Microscopy)

**Amended water** - Water to which a surfactant (wetting agent) has been added to increase the penetrating ability of the liquid.

**Asbestos** - Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered. Asbestos also includes PACM, as defined below.

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

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

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

**Asbestos waste decontamination facility** - A system consisting of drum/bag washing facilities and a temporary storage area for cleaned containers of asbestos waste. Used as the exit for waste and equipment leaving the regulated area. In an emergency, it may be used to evacuate personnel.

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

**Authorized person** - Any person authorized by the VA, the Contractor, or government agency and required by work duties to be present in regulated areas.

**Authorized visitor** - Any person approved by the VA; the contractor; or any government agency having jurisdiction over the regulated area.

**Barrier** - Any surface ~~the~~ that isolates the regulated area and inhibits fiber migration from the regulated area.

**Containment Barrier** - An airtight barrier consisting of walls, floors, and/or ceilings of sealed plastic sheeting which surrounds and seals the outer perimeter of the regulated area.

**Critical Barrier** - The barrier responsible for isolating the regulated area from adjacent spaces, typically constructed of plastic sheeting secured in place at openings such as doors, windows, or any other opening into the regulated area.

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

**Secondary Barrier** - Any additional sheeting used to isolate and provide protection from debris during abatement work.

**Breathing zone** - The hemisphere forward of the shoulders with a radius of about 150 - 225 mm (6 - 9 inches) from the worker's nose.

**Building/facility owner** - The legal entity, including a lessee, which exercises control over management and record keeping functions relating to a building and/or facility in which asbestos activities take place.

**Bulk testing** - The collection and analysis of suspect asbestos containing materials.

**Certified Industrial Hygienist (CIH)** - One certified in practice of industrial hygiene by the American Board of Industrial Hygiene. An

industrial hygienist Certified in Comprehensive Practice by the American Board of Industrial Hygiene.

**Class I asbestos work** - Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and Presumed Asbestos Containing Material (PACM).

**Class II asbestos work** - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.

**Clean room/Change room** - An uncontaminated room having facilities for the storage of employee's street clothing and uncontaminated materials and equipment.

**Clearance sample** - The final air sample taken after all asbestos work has been done and visually inspected.  
Performed by the CPIH with confirmation clearance performed by the VPIH.  
May not be required for a total demolition project since personnel will not return to the building.

**Competent person** - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f); in addition, for Class I and II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor.

**Contracting Officer's Technical Representative (COTR)** - VA representative responsible for the on-going project work, typically the COTR (RE).

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

**Decontamination area/unit** - An enclosed area adjacent to and connected to the regulated area and consisting of an equipment room, shower room, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

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

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

**Disposal bag** - Typically 6 mil thick siftproof, dustproof, leaktight container used to package and transport asbestos waste from regulated areas to the approved landfill. Each bag/container must be labeled/marked in accordance with EPA, OSHA and DOT requirements.

**Disturbance** - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or disposal bag which shall not exceed 60 inches in length or width.

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

**Enclosure** - The construction of an air tight, impermeable, permanent barrier around ACM to control the release of asbestos fibers from the material and also eliminate access to the material.

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

**Equipment room** - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

**Fiber** - A particulate form of asbestos, 5 microns or longer, with a length to width ratio of at least 3 to 1.

**Fibers per cubic centimeter (f/cc)** - Abbreviation for fibers per cubic centimeter, used to describe the level of asbestos fibers in air.

**Filter** - Media used in respirators, vacuums, or other machines to remove particulate from air.

**Friable asbestos containing material** - Any material containing more than 1 percent asbestos as determined using the method specified in appendix A, Subpart F, 40 CFR 763, section 1, Polarized Light Microscopy, that,

when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

**Glovebag** - Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which materials and tools may be handled.

**High efficiency particulate air (HEPA) filter** - A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 microns or greater in diameter.

**HEPA vacuum** - Vacuum collection equipment equipped with a HEPA filter system capable of collecting and retaining asbestos fibers.

**Homogeneous area** - An area of surfacing, thermal system insulation or miscellaneous ACM that is uniform in color, texture and date of application.

**HVAC** - Heating, Ventilation and Air Conditioning

**Industrial hygienist - AIHA** - An Industrial Hygienist is a person having a college or university degree or degrees in engineering, physics, or medicine or related biological sciences who, by virtue of special studies and training, has acquired competence in industrial hygiene. Such special studies and training must have been sufficient in all of the above cognate sciences to provide the abilities: (1) to recognize the environmental factors and stresses associated with work and work operations and to understand their effect on humans and their well being; (2) to evaluate, on the basis of experience and with the aid of quantitative measurement techniques, the magnitude of these stresses in terms of ability to impair human health and well being; and (3) to prescribe methods to eliminate, control or reduce such stresses when necessary to alleviate their effects. (AIHA).

**Industrial hygienist technician** - A person working under the direction of an IH or CIH who has special training, experience, certifications and licenses required for the industrial hygiene work assigned.

**Intact** - The ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

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

**Negative initial exposure assessment** - A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PEL's.

**Negative pressure** - Air pressure which is lower than the surrounding area, created by exhausting air from a sealed regulated area through HEPA equipped filtration units. OSHA requires maintaining -0.02" water gauge inside the negative pressure enclosure.

**Negative pressure respirator** - A respirator in which the air pressure inside the facepiece is negative during inhalation relative to the air outside the respirator.

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

**Outside air** - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open ferry dock.

**Owner/operator** - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

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

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

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

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

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

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

**Professional IH** - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29 CFR 1926.1101 (b); has completed two specialized EPA approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH.

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

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

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

**Regulated area** - An area established by the employer to demarcate where Class I, II, III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and an area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed the PEL.

**Regulated ACM (RACM)** - Friable ACM; Category I nonfriable ACM that has become friable; Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or; Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of the demolition or renovation operation.

**Removal** - All operations where ACM, PACM and/or RACM is taken out or stripped from structures or substrates, including demolition operations.

**Renovation** - Altering a facility or one or more facility components in any way, including the stripping or removal of asbestos from a facility component which does not involve demolition activity.

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

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



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

**Surfactant** - A chemical added to water to decrease water's surface tension thus making it more penetrating into ACM.

**Thermal system ACM** - A material containing more than 1 percent asbestos applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.

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

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

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

**Waste generator** - Any owner or operator whose act or process produces asbestos-containing waste material.

**Waste shipment record** - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

**Wet cleaning** - The process of thoroughly eliminating, by wet methods, any asbestos contamination from surfaces or objects.

### 1.3.3 REFERENCED STANDARDS ORGANIZATIONS:

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

- A. VA Department of Veterans Affairs  
810 Vermont Avenue, NW  
Washington, DC 20420
- B. CFR Code of Federal Regulations  
Government Printing Office  
Washington, DC 20420
- C. EPA Environmental Protection Agency  
401 M St., SW  
Washington, DC 20460  
202-382-3949
- D. MIL-STD Military Standards/Standardization Division  
Office of the Assistant Secretary of Defense

Washington, DC 20420

- E. NEC National Electrical Code (by NFPA)
- F. NEMA National Electrical Manufacturer's Association  
2101 L Street, N.W.  
Washington, DC 20037
- G. NFPA National Fire Protection Association  
1 Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9101  
800-344-3555
- H. OSHA Occupational Safety and Health Administration  
U.S. Department of Labor  
Government Printing Office  
Washington, DC 20402
- I. DOT Department of Transportation  
Washington, DC 20590

#### **1.4 APPLICABLE CODES AND REGULATIONS**

##### **1.4.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS:**

- A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards and codes governing asbestos abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification. States may have requirements that exempt Federal facilities from compliance with State regulations, contractors performing asbestos related work at VA facilities shall comply with State requirements, including licensing and accreditation.
- B. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specification exists, the most stringent requirement(s) shall be utilized.
- C. Copies of all standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite in the Abatement Contractor's office area/clean room.

##### **1.4.2 ABATEMENT CONTRACTOR RESPONSIBILITY:**

The Abatement Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State and Local regulations related to any and all aspects of the abatement project. The contractor

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

#### **1.4.3 FEDERAL REQUIREMENTS:**

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

- A. Occupational Safety and Health Administration (OSHA)
  - 1. Title 29 CFR 1926 - Construction Standard Requirements - Demolition Work
  - 2. Title 29 CFR 1910.38(a); (b) - Emergency Action Plan
  - 3. Title 29 CFR 1910.132 - Personal Protective Equipment
  - 4. Title 29 CFR 1910.20 - Access to Employee Exposure and Medical Records
  - 5. Title 29 CFR 1910.1200 - Hazard Communication
  - 6. Title 29 CFR 1910.151 - Medical and First Aid
- B. Environmental Protection Agency (EPA)
  - 1. Title 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
  - 2. Title 40 CFR 763 - Asbestos Hazard Emergency Response Act (AHERA) and Asbestos School Hazard Abatement Reauthorization Act (ASHARA).

#### **1.4.4 STATE REQUIREMENTS:**

- A. State requirements that apply to the abatement work include, but are not limited to, the following:
  - 1. Guidelines as set forth by the West Virginia Department of Environmental Protection, Division of Air Quality.

#### **1.4.5 PERMITS/LICENSES:**

The Abatement Contractor shall apply for and have on-site all required permits and licenses to perform abatement work as required by Federal, State, and Local regulations.

#### **1.4.6 POSTING AND FILING OF REGULATIONS:**

Maintain one (1) copy of all applicable federal, state, and local regulations. The regulations will be kept in the Abatement Contractor's

office for access. If required, the Contractor shall comply with all applicable State licensing requirements.

**1.4.7 VA RESPONSIBILITIES:**

Prior to commencement of work:

- A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Typically, in a total demolition, no occupants will be in the building. Arrangements must be made prior to starting work for relocation of desks, files, equipment and personal possessions to avoid unauthorized access into the abatement regulated area. The Contractor is to document, in a log, all notifications given.

**1.4.8 SITE SECURITY:**

- A. Regulated area access is to be restricted only to authorized, trained and protected personnel. These may include the Abatement Contractor's employees, employees of Subcontractors, VA employees and representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the office area of the Abatement Contractor.
- B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Abatement Contractor's Competent Person/VACO by anyone observing the entry.
- C. The Abatement Contractor's Competent Person shall control site security during abatement operations as required by OSHA/State in order to isolate work in progress and protect adjacent personnel.
- D. Regulated areas shall be secured during non-working hours and checked by VA security.

**1.4.9 EMERGENCY ACTION PLAN AND ARRANGEMENTS:**

- A. An Emergency Action Plan shall be developed by the Abatement Contractor prior to commencing abatement activities and shall be agreed to by the Abatement Contractor and the VA representative. The Plan shall meet the requirements of OSHA 29 CFR 1910.38 (a); (b).
- B. Emergency procedures shall be in written form and prominently posted. All personnel must be trained prior to entering regulated areas in these procedures and sign that they understand the emergency procedures.
- C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedules and any barriers that may affect response capabilities.

- D. Abatement Contractor emergency planning shall include consideration of asbestos exposure, fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness, as needed. Written procedures for response to anticipated emergency situations shall be developed.
- E. Employees shall be trained in site evacuation procedures in the event of workplace emergencies.
  - 1. For non life-threatening situations - employees injured or otherwise incapacitated shall follow procedures with assistance from fellow workers, if necessary.
  - 2. For life-threatening injury or illness, secure proper medical treatment.
- F. Telephone numbers of all emergency response personnel shall be prominently posted along with the location of the nearest telephone.
- G. The Abatement Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3 minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel designated to provide first aid/CPR.
- H. The Abatement Contractor shall provide a physician's approved first aid kit for use on the project. The first aid kit will be kept in the Abatement Contractor's office area.
- I. The Emergency Action Plan shall provide for a contingency plan in the event that an incident occurs that may require the modification of the standard operating procedures during abatement. Such incidents include, but are not limited to, asbestos exposure; fire; accident; power failure and confined spaces. The Abatement Contractor shall detail procedures to be followed in the event of an incident assuring that work is stopped until correction of the problem.

#### **1.4.10 ACCIDENT PREVENTION**

- A. The Abatement Contractor shall provide and maintain a work environment and procedures which will safeguard the public and VA staff personnel, property, materials, supplies, and equipment which may be adjacent to the Abatement Contractor's regulated areas. The Abatement Contractor will avoid interruptions of VA operations so the project will be completed on schedule.
- B. While performing abatement activities, the Abatement Contractor shall provide all/any required safety barricades, signs, and signal lights. The Abatement Contractor shall comply with all applicable standards

related to abatement operations as mandated by OSHA/EPA/State Standards.

The Abatement Contractor shall provide a copy of and comply with the pertinent provisions of the latest version of the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1.

- C. Whenever the Contracting Officer (CO) becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public or VA patients/personnel, the CO shall notify the Abatement Contractor's Competent Person orally, with written confirmation and request immediate corrective action(s) be taken to abate the noncompliant condition. This notice, when delivered to the Abatement Contractor or the Contractor's representative, shall be deemed sufficient notice of noncompliance and that corrective action is required. The Abatement Contractor shall take corrective action immediately upon receipt of the oral/written notice. If the Abatement Contractor fails or refuse to promptly take corrective action, the CO has the option to issue an order to stop all or part of the work until correction actions have been taken. The Abatement Contractor shall have no entitlement to any equitable adjustment of the contract price or extension of the performance schedule based on any stop work order issued under this clause.
- D. The Abatement Contractor shall include the provisions of 1.4.11 in any subcontractor agreement.
- E. The Abatement Contractor shall submit a written plan for implementing 1.4.11. The plan shall include an analysis of any significant hazards to life, limb, and property inherent to abatement work and a plan for controlling these hazards.
- F. The COTR or other designated VA employee, if designated by the CO, shall serve as the Safety Officer and has authority to enforce the Accident Prevention requirements.

**1.4.11 PRE-ABATEMENT MEETING:**

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

- A. Proof of Contractor State licensing.

- B. Proof the Competent Person is trained and approved for working in this State. Verification of the experience of the Competent Person shall also be presented.
- C. A list of all workers who will participate in the project, including experience and verification of medical surveillance and training certification/card.
- D. A list of and verification of training for all personnel who have current first-aid/CPR/bloodborne pathogen training. A minimum of one person per shift must be the designated first aid provider.
- E. A copy of the Abatement Contractor's Standard Operating Procedures for Abatement. In these procedures, the following information must be detailed and specific for this project.
  - 1. Abatement regulated area isolation/preparation procedures;
  - 2. Abatement methods/procedures and equipment to be used;
  - 3. Personal protective equipment to be used;
  - 4. Sampling strategy plan to be used at the site.
- F. A list of the locations and abatement methods for RACM.
- G. A list of ACM to remain in place.
- H. At this meeting the Abatement Contractor shall provide all submittals as required by the specification.
- I. Emergency Action Plan and Accident Prevention Plan procedures.

#### **1.5 ABATEMENT PROJECT COORDINATION:**

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

##### **1.5.1 PERSONNEL**

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

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

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

1. The Abatement Contractor has conducted within the last three (3) years, three (3) projects of similar complexity and dollar value as this project; has not been cited and penalized for serious violations of abatement regulations in the past three (3) years; has adequate liability/occurrence insurance for asbestos work; is licensed in applicable states; has adequate and qualified personnel available to complete the work; has comprehensive standard operating procedures for abatement work; has adequate equipment and supplies to perform the work.
2. The Competent Person has four (4) years of abatement experience of which two (2) years were as the Competent Person/On-site Supervisor on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project; has completed EPA/OSHA/State/Local training requirements for awareness training and refreshers for asbestos and lead.

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

## **1.6 WORKER PROTECTION:**

### **1.6.1 TRAINING OF ABATEMENT PERSONNEL:**

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

### **1.6.2 PERSONAL PROTECTIVE EQUIPMENT:**

Provide, at a minimum, steel toe boots, hard hats, safety glasses, protective clothing, respiratory protection and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). A copy of the hazard assessment shall be provided to the VPIH. The Competent Person and CPIH shall ensure the provision of and the integrity of personal protective equipment worn for the duration of the project.



## **1.7 RESPIRATORY PROTECTION:**

### **1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM:**

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

### **1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR:**

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

### **1.7.3 SELECTION AND USE OF RESPIRATORS:**

The procedure for the selection and use of respirators must be submitted to the VA as part of the Abatement Contractor's qualification. The procedure must be written clearly enough for workers to understand. A copy of the Respiratory Protection Program must be available in the clean room of the decontamination unit for reference by employees or authorized visitors.

### **1.7.4 MINIMUM RESPIRATORY PROTECTION**

Minimum respiratory protection shall be a full face powered air purifying respirator when fiber levels are maintained consistently at or below 0.5 f/cc. A higher level of respiratory protection may be provided or required, depending on fiber levels. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h); Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

### **1.7.5 MEDICAL WRITTEN OPINION:**

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

### **1.7.6 RESPIRATOR FIT TEST:**

All personnel wearing respirators shall have a current qualitative/quantitative fit test which was conducted in accordance with 29 CFR 1910.134 (f) and Appendix A.

#### **1.7.7 RESPIRATOR FIT CHECK:**

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

#### **1.7.8 MAINTENANCE AND CARE OF RESPIRATORS:**

The Respiratory Protection Program Coordinator shall submit evidence and documentation showing compliance with 29 CFR 1910.134 (h) Maintenance and care of respirators.

### **1.8 WORKER PROTECTION:**

#### **1.8.1 TRAINING OF ABATEMENT PERSONNEL:**

Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101 (k) (9) and any additional State/Local requirements. Training must include, at a minimum, the elements listed at 29 CFR 1926.1101 (k) (9) (viii). Training shall have been conducted by a third party, EPA/State approved trainer meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training certificates and current refresher and accreditation proof must be submitted for each person working at the site.

#### **1.8.2 MEDICAL EXAMINATIONS:**

Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. The physician's written opinion as required by 29 CFR 1926.1101 (m) (4) shall be provided for each person and shall include in the opinion the person has been evaluated for working in a heat stress environment while wearing personal protective equipment and is able to perform the work.

#### **1.8.3 PROTECTIVE CLOTHING:**

Provide boots, booties, hard hats, goggles, clothing, respirators and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). Provide all personnel entering the regulated area with disposable full body coveralls, disposable head covering, and 18 inch boot coverings. The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project. Provide plastic/rubber disposable gloves for hand protection. Cloth type gloves may be worn

under plastic/rubber gloves, but cannot be used alone. Duct tape shall be used to secure all suit sleeves to wrists and to secure foot coverings at the ankle.

#### **1.8.4 REGULATED AREA ENTRY PROCEDURE:**

Worker protection shall meet the most stringent requirement. The Competent Person shall ensure that each time workers enter the regulated area, they remove ALL street clothes in the clean room of the decontamination unit and put on new disposable coveralls, head coverings, a clean respirator, and then proceed through the shower room to the equipment room where they put on non-disposable required personal protective equipment.

#### **1.8.5 DECONTAMINATION PROCEDURE - PAPR:**

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

- A. When exiting the regulated area, remove disposable coveralls, and ALL other clothes, disposable head coverings, and foot coverings or boots in the equipment room.
- B. Still wearing the respirator and completely naked, proceed to the shower. Showering is MANDATORY. Care must be taken to follow reasonable procedures in removing the respirator to avoid asbestos fibers while showering. The following procedure is required as a minimum:
  1. Thoroughly wet body including hair and face. If using a PAPR hold blower above head to keep filters dry.
  2. With respirator still in place, thoroughly decontaminate body, hair, respirator face piece, and all other parts of the respirator except the blower and battery pack on a PAPR. Pay particular attention to cleaning the seal between the face and respirator facepiece and under the respirator straps.
  3. Take a deep breath, hold it and/or exhale slowly, completely wetting hair, face, and respirator. While still holding breath, remove the respirator and hold it away from the face before starting to breathe.
- C. Carefully decontaminate the facepiece of the respirator inside and out. If using a PAPR, shut down using the following sequence: a) first cap inlets to filters; b) turn blower off to keep debris collected on the inlet side of the filter from dislodging and contaminating the outside of the unit; c) thoroughly decontaminate blower and hoses; d) carefully decontaminate battery pack with a wet rag being cautious of getting water in the battery pack thus preventing destruction.

**THIS PROCEDURE IS NOT A SUBSTITUTE FOR RESPIRATOR CLEANING!**

- D. Shower and wash body completely with soap and water. Rinse thoroughly.
- E. Rinse shower room walls and floor to drain prior to exiting.
- F. Proceed from shower to clean room; dry off and change into street clothes or into new disposable work clothing.

**1.8.6 REGULATED AREA REQUIREMENTS:**

The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for regulated areas at 29 CFR 1926.1101 (e) are met. All personnel in the regulated area shall not be allowed to eat, drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

**1.9 DECONTAMINATION FACILITIES:**

**1.9.1 DESCRIPTION:**

Provide each regulated area with separate personnel (PDF) and equipment/waste decontamination facilities (EWDF). Ensure that the PDF are the only means of ingress and egress to the regulated area and that all equipment, bagged waste, and other material exit the regulated area only through the EWDF. Separate shower facilities must be provided for males/females as per OSHA requirements. See drawings for minimum requirements of each and OSHA 29 CFR 1926.1101, Appendix F.

**1.9.2 GENERAL REQUIREMENTS:**

All personnel entering or exiting a regulated area shall follow the requirements at 29 CFR 1926.1101 (j) (1) and these specifications. All equipment and materials must exit the regulated area through the EWDF and be decontaminated in accordance with these specifications. Walls and ceilings of the PDF and EWDF must be constructed of a minimum of 2 layers of 6 mil white fire retardant polyethylene sheeting and be securely attached to existing building components and/or an adequate temporary framework. A minimum of 2 layers of 6 mil poly shall also be used to cover the floor under the EWDF and PDF units. Construct doors so that they overlap and secure to adjacent surfaces. Weigh sheets with layers of duct tape so that they close quickly after release. Put arrows on sheets so they show direction of travel and overlap. If the building adjacent area is occupied, construct a solid barrier on the occupied side(s) to protect the sheeting.

**1.9.3 TEMPORARY FACILITIES TO THE PDF AND EWDF:**

The Abatement Contractor shall provide temporary water service connections to the EWDF and PDF. Backflow prevention must be provided at the point of connection to the VA system. Water supply must be of

adequate pressure and meet requirements of 29 CFR 1910.141(d)(3). Provide adequate temporary electric power with ground fault protection and overhead wiring in the EWDF and PDF. Provide a sub-panel for all temporary power in the clean room. Provide adequate lighting to provide a minimum of 50 foot candles in the EWDF and PDF. Provide temporary heat to maintain 70°F throughout the PDF and EWDF except the shower of the PDF shall be maintained at 75°F.

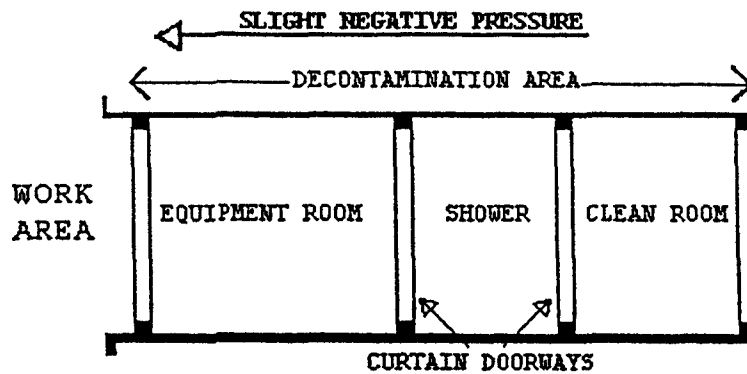
#### **1.9.4 PERSONNEL DECONTAMINATION FACILITY (PDF) :**

The Abatement Contractor shall provide a PDF consisting of shower room which is contiguous to a clean room and equipment room. The PDF must be sized to accommodate the number of personnel scheduled for the project. The shower room, located in the center of the PDF, shall be fitted with as many portable showers as necessary to insure all employees can complete the entire decontamination procedure within 15 minutes. The PDF shall be constructed of opaque poly for privacy. The PDF shall be constructed to eliminate any parallel routes of egress without showering.

1. Clean Room: The clean room must be physically and visually separated from the rest of the building to protect the privacy of personnel changing clothes. The clean room shall be constructed of at least 2 layers of 6 mil fire retardant poly to provide an air tight room. Provide a minimum of 2 - 900 mm (3 foot) wide flapped doorways. One doorway shall be the entry from outside the PDF and the second doorway shall be to the shower room of the PDF. The floor of the clean room shall be maintained in a clean, dry condition. Shower overflow shall not be allowed into the clean room. All surfaces in the clean room shall be disinfected twice after each shift change. An adequate supply of disposable towels and disposable protective clothing shall be provided. Provide 1 storage lockers per person. Portable fire extinguisher, Type ABC, shall be provided in accordance with OSHA and NFPA Standard 10. All persons entering the regulated area shall remove all street clothing in the clean room and dress in disposable protective clothing and respiratory protection. Any person entering the clean room does so either from the outside with street clothing on or is coming from the shower room completely naked and thoroughly washed. Females required to enter the regulated area shall be ensured of their privacy throughout the entry/exit process by posting guards at both entry points to the PDF so no male can enter or exit the PDF during her stay in the PDF.

2. Shower Room: The Competent Person shall assure that the shower room is a completely water tight compartment to be used for the movement of all personnel from the clean room to the equipment room and for the showering of all personnel going from the regulated area to the clean room. Each shower shall be constructed so water runs down the walls of the shower and into a drip pan. Install a freely draining smooth floor on top of the shower pan. The shower room shall be separated from the rest of the building and from the clean room and equipment room using air tight walls made from at least 2 layers of 6 mil fire retardant poly. The shower shall be equipped with a shower head and controls, hot and cold water, drainage, soap dish and continuous supply of soap, and shall be maintained in a sanitary condition throughout its use. The controls shall be arranged so an individual can shower without assistance. Provide a flexible hose shower head, hose bibs and all other items shown on Shower Schematic. Waste water will be pumped to a drain after being filtered through a minimum of a 100 micron sock in the shower drain; a 20 micron filter; and a final 5 micron filter. Filters will be changed a minimum of daily or more often as needed. Filter changes must be done in the shower to prevent loss of contaminated water. Hose down all shower surfaces after each shift and clean any debris from the shower pan. Residue is to be disposed of as asbestos waste.
3. Equipment Room: The Competent Person shall provide an equipment room which shall be an air tight compartment for the storage of work equipment, reusable footwear and for use as a change station for personnel exiting the regulated area. The equipment room shall be separated from the regulated area by a minimum 3 foot wide door made of three layers of 6 mil fire retardant poly. The equipment room shall be separated from the regulated area, the shower room and the rest of the building by air tight walls and ceiling constructed of a minimum of 2 layers of 6 mil fire retardant poly. If the airborne level of asbestos in the regulated area is expected to exceed 0.5 f/cc, add an intermediate cleaning space between the equipment room and the regulated area. Damp wipe all surfaces of the equipment room after each shift change. Provide an additional loose layer of 6 mil fire retardant poly per shift change and remove this layer after each shift. Provide a temporary electrical sub-panel in this room to accommodate any power tools and equipment used in the regulated area.

4. The PDF shall look like as follows: Clean room at the entrance followed by a shower room followed by an equipment room leading to the regulated area. Each doorway in the PDF is minimum of double flaps of 6 mil fire retardant poly.

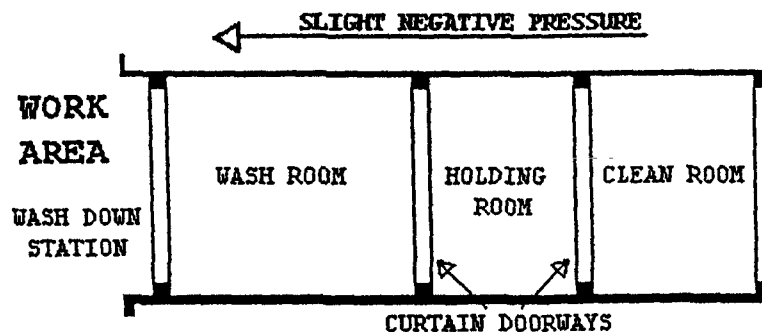


#### 1.9.5 EQUIPMENT/WASTE DECONTAMINATION FACILITY (EWDF) :

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

1. Wash Down Station: Provide an enclosed shower unit in the regulated area just outside the Wash Room as an equipment bag and container cleaning station.
2. Wash Room: Provide a wash room for cleaning of bagged or containerized asbestos containing waste materials passed from the regulated area. Construct the wash room using 50 x 100 mm (2" x 4") wood framing and 2 layers of 6 mil fire retardant poly. Locate the wash room so that packaged materials, after being wiped clean, can be passed to the Holding Room. Doorways in the wash room shall be constructed of two layers of 6 mil fire retardant poly.
3. Holding Room: Provide a holding room as a drop location for bagged materials passed from the wash room. Construct the holding room using 50 x 100 mm (2" x 4") wood framing and 2 layers of 6 mil fire

- retardant poly. The holding room shall be located so that bagged material cannot be passed from the wash room to the clean room unless it goes through the holding room. Doorways in the holding room shall be constructed of two layers of 6 mil fire retardant poly.
4. Clean Room: Provide a clean room to isolate the holding room from the building exterior. Construct the clean room using 2 x 4 wood framing and 2 layers of 6 mil fire retardant poly. The clean room shall be located so as to provide access to the holding room from the building exterior. Doorways to the clean room shall be constructed of two layers of 6 mil fire retardant poly. When a negative pressure differential system is used, a rigid enclosure separation between the EWDF clean room and the adjacent areas shall be provided.
  5. The EWDF shall be provided as follows: Wash Room leading to a Holding Room followed by a Clean Room leading to the Outside. See diagram.



#### **1.9.6 EQUIPMENT/WASTE DECONTAMINATION PROCEDURES:**

At washdown station in the regulated area, thoroughly wet clean contaminated equipment and/or sealed polyethylene bags and pass into Wash Room after visual inspection. When passing anything into the Wash Room, close all doorways of the EWDF, other than the doorway between the washdown station and the Wash Room. Keep all outside personnel clear of the EWDF. Once inside the Wash Room, wet clean the equipment and/or bags. After cleaning and inspection, pass items into the Holding Room. Close all doorways except the doorway between the Holding Room and the Clean Room. Workers from the Clean Room/Exterior shall enter the Holding Room and remove the decontaminated/cleaned equipment/bags for removal and disposal. These personnel shall wear full protective clothing and



appropriate respirators. At no time shall personnel from the clean side be allowed to enter the Wash Room.

## **PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT**

### **2.1 MATERIALS AND EQUIPMENT**

#### **2.1.1 GENERAL REQUIREMENTS (ALL ABATEMENT PROJECTS) :**

Prior to the start of work, the abatement contractor shall provide and maintain a sufficient quantity of materials and equipment to assure continuous and efficient work throughout the duration of the project. Work shall not start unless the following items have been delivered to the site and the CPIH has submitted verification to the VA's representative to this effect:

- A. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
- B. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination. Flammable materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.
- C. The Abatement Contractor shall not block or hinder use of buildings by placing materials/equipment in any unauthorized place.
- D. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.
- E. Polyethylene sheeting for walls in the regulated area shall be a minimum of 4-mil thick. For floors and all other uses, sheeting of at least 6-mil thickness shall be used in widths selected to minimize the frequency of joints. Fire retardant poly shall be used throughout.
- F. The method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination of moisture resistant duct tape or other waterproof tape, furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or other effective procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions (including the use of amended water).
- G. Polyethylene sheeting utilized for personnel decontamination facility shall be opaque white or black in color, 6 mil fire retardant poly.

- H. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided.
- I. An adequate number of negative pressure units capable of providing a minimum of 4 actual air changes per hour in the regulated area while maintaining -0.02" water column plus two reserve units available to replace any malfunctioning unit without delay shall be provided.
- J. An adequate number of HEPA vacuums, air sampling pumps and loaded filter cassettes, supplied air system, if used, providing Grade D breathing air with respirators and air lines sufficient for personnel, pressure differential gauge and recording capability shall be provided.
- K. An adequate number of scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements, fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be equipped with ground-fault circuit protection.
- L. 6 mil disposal bags for asbestos waste shall be pre-printed with labels and markings as required by OSHA, EPA and DOT regulations.
- M. The VA shall be provided a copy of the MSDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication. Methylene chloride shall not be used with any spray adhesive or other product.
- N. DANGER signs, as many and as required by OSHA 29 CFR 1926.1101(k) (7) shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.
- O. Adequate respirators, disposable protective clothing, hard hats, goggles, gloves and footwear for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a hazard assessment conducted under 29 CFR 1910.132(d).

#### **2.1.2 NEGATIVE PRESSURE FILTRATION SYSTEM:**

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

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

#### **2.1.3 DESIGN AND LAYOUT:**

Before start of work submit the design and layout of the regulated area and the negative air machines. The submittal shall indicate the number of, location of and size of negative air machines. The point(s) of exhaust, air flow within the regulated area, anticipated negative pressure differential, and supporting calculations for sizing shall be provided. In addition, submit the following:

1. Manufacturer's information on the negative air machine(s).
2. Method of supplying power to the units and designation/location of the panels.
3. Description of testing method(s) for correct air volume and pressure differential. Provide manufacturer's product data on the pressure differential measuring device used.
4. If auxiliary power supply is to be provided for the negative air machines, provide a schematic diagram of the power supply and manufacturer's data on the generator and switch.

#### **2.1.4 NEGATIVE AIR MACHINES (HEPA UNITS) :**

- A. Negative Air Machine Cabinet: The cabinet shall be constructed of steel or other durable material capable of withstanding potential damage from rough handling and transportation. The width of the cabinet shall be less than 30" in order to fit in standard doorways. The cabinet must be factory sealed to prevent asbestos fibers from being released during use, transport, or maintenance. Any access to and replacement of filters shall be from the inlet end. The unit must be on casters or wheels.
- B. Negative Air Machine Fan: The rating capacity of the fan must be the air moving capacity under actual operating conditions. Manufacturer's typically use "free-air" (no resistance) conditions when rating fans. The fan must be a centrifugal type fan.
- C. Negative Air Machine Final Filter: The final filter shall be a HEPA filter. The filter media must be completely sealed on all edges within a structurally rigid frame. The filter shall align with a continuous flexible gasket material in the negative air machine housing to form an air tight seal. Each HEPA filter shall be individually tested and certified by the manufacturer to have an efficiency of not less than 99.97% when challenged with 0.3  $\mu$ m dioctylphthalate (DOP) particles. Testing shall have been done in accordance with Military Standard MIL-

STD-282 and Army Instruction Manual 136-300-175A. Each filter must bear a UL586 label to indicate ability to perform under specified conditions.

Each filter shall be marked with the name of the manufacturer, serial number, air flow rating, efficiency and resistance, and the direction of test air flow.

- D. Negative Air Machine Pre-filters: The pre-filters, which protect the final HEPA filter by removing larger particles, are required to prolong the operating life of the HEPA filter. Two stages of pre-filtration are required. A first stage pre-filter shall be a low efficiency type for particles 10 µm or larger. A second stage pre-filter shall have a medium efficiency effective for particles down to 5 µm or larger. Pre-filters shall be installed either on or in the intake grid of the unit and held in place with a special housing or clamps.
- E. Negative Air Machine Instrumentation: Each unit must be equipped with a gauge to measure the pressure drop across the filters and to indicate when filters have become loaded and need to be changed. A table indicating the cfm for various pressure readings on the gauge shall be affixed near the gauge for reference or the reading shall indicate at what point the filters shall be changed, noting cfm delivery at that point. The unit must have an elapsed time meter to show total hours of operation.
- F. Negative Air Machine Safety and Warning Devices: An electrical/mechanical lockout must be provided to prevent the fan from being operated without a HEPA filter. Units must be equipped with an automatic shutdown device to stop the fan in the event of a rupture in the HEPA filter or blockage in the discharge of the fan. Warning lights are required to indicate normal operation; too high a pressure drop across filters; or too low of a pressure drop across filters.
- G. Negative Air Machine Electrical: All electrical components shall be approved by the National Electrical Manufacturer's Association (NEMA) and Underwriter's Laboratories (UL). Each unit must be provided with overload protection and the motor, fan, fan housing, and cabinet must be grounded.

#### **2.1.5 PRESSURE DIFFERENTIAL:**

The fully operational negative air system within the regulated area shall continuously maintain a pressure differential of -0.02" water column. Before any disturbance of any asbestos material, this shall be demonstrated to the VA by use of a pressure differential meter/manometer as required by OSHA 29 CFR 1926.1101(e) (5) (i). The Competent Person

shall be responsible for providing and maintaining the negative pressure and air changes as required by OSHA and this specification.

**2.1.6 MONITORING:**

The pressure differential shall be continuously monitored and recorded between the regulated area and the area outside the regulated area with a monitoring device that incorporates a strip chart recorder. The strip chart recorder shall become part of the project log and shall indicate at least -0.02" water column for the duration of the project.

**2.1.7 AUXILIARY GENERATOR:**

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

**2.1.8 SUPPLEMENTAL MAKE-UP AIR INLETS:**

Provide, as needed for proper air flow in the regulated area, in a location approved by the VA, by making openings in the plastic sheeting to allow outside air to flow into the regulated area. Auxiliary makeup air inlets must be located as far from the negative air machines as possible, off the floor near the ceiling, and away from the barriers that separate the regulated area from the occupied clean areas. Cover the inlets with weighted flaps which will seal in the event of failure of the negative pressure system. The flap must be sprayed with adhesive to assure sealing if it closes.

**2.1.9 TESTING THE SYSTEM:**

The negative pressure system must be tested before any ACM is disturbed in any way. After the regulated area has been completely prepared, the decontamination units set up, and the negative air machines installed, start the units up one at a time. Demonstrate and document the operation and testing of the negative pressure system to the VA using smoke tubes and a negative pressure gauge. Testing must also be done at the start of each work shift.

**2.1.10 DEMONSTRATION OF THE NEGATIVE AIR PRESSURE SYSTEM:**

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

- A. Plastic barriers and sheeting move inwards in the regulated area.
- B. Curtains of the decontamination units move towards the regulated area.

- C. There is a noticeable movement of air through the decontamination units. Use the smoke tube to demonstrate air movement from the clean room to the shower room to the equipment to the regulated area.
- D. Use smoke tubes to demonstrate air is moving air across all areas in which work is to be done. Use a differential pressure gauge to indicate a negative pressure of at least 5.0 Pa (-0.02") across every barrier separating the regulated area from the rest of the building. Modify the system as necessary to meet the above requirements.

#### **2.1.11 USE OF SYSTEM DURING ABATEMENT OPERATIONS:**

- A. Start units before beginning any disturbance of RACM occurs. After work begins, the units shall run continuously, maintaining 4 actual air changes per hour at a negative pressure differential of 5.0 Pa (-0.02") water column, for the duration of the work until a final visual clearance and final air clearance has been completed.
- B. The negative air machines shall not be shut down for the duration of the project unless authorized by the COTR/VPIH, in writing.
- C. Abatement work shall begin at a location farthest from the units and proceed towards them. If an electric failure occurs, the Competent Person shall stop all abatement work and immediately begin wetting all exposed asbestos materials for the duration of the power outage. Abatement work shall not resume until power is restored and all units necessary are operating properly again.
- D. The negative air machines shall continue to run after all work is completed and until a final visual clearance and a final air clearance has been completed for that regulated area.

#### **2.1.12 DISMANTLING THE SYSTEM:**

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

### **2.2 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA:**

#### **2.2.1 GENERAL:**

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

#### **2.2.2 PREPARATION PRIOR TO SEALING THE REGULATED AREA:**

Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. Remove all uncontaminated removable furniture, equipment and/or supplies from the regulated area before commencing work. Lock out and tag out any HVAC systems in the regulated area.

#### **2.2.3 CONTROLLING ACCESS TO THE REGULATED AREA:**

Access to the regulated area is allowed only through the personnel decontamination facility (PDF). All other means of access shall be eliminated and OSHA Danger signs posted as required by OSHA. If the regulated area is adjacent to or within view of an occupied area, provide a visual barrier of opaque fire retardant poly sheeting at least 4 mils thick to prevent building occupant observation.

#### **2.2.4 CRITICAL BARRIERS:**

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

#### **2.2.5 PRIMARY BARRIERS:**

- A. Cover the regulated area with two layers of 6 mil fire retardant poly on the floors and two layers of 4 mil fire retardant poly on the walls, unless otherwise directed in writing by the VA representative. Floor layers must form a right angle with the wall and turn up the wall at least 300 mm (12"). Seams must overlap at least 1800 mm (6') and must be spray glued and taped. Install sheeting so that layers can be removed independently from each other. Mechanically support and seal with duct tape and glue all wall layers.
- B. If stairs and ramps are covered with 6 mil plastic, two layers must be used. Provide 19 mm (3/4") exterior grade plywood treads held in place with duct tape/glue on the plastic. Do not cover rungs or rails with any isolation materials.

#### **2.2.6 SECONDARY BARRIERS:**

A loose layer of 6 mil shall be used as a drop cloth to protect the primary layers from debris generated during the abatement. This layer shall be replaced as needed during the work.

#### **2.2.7 EXTENSION OF THE REGULATED AREA:**

If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the

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

## **2.3 MONITORING, INSPECTION AND TESTING:**

### **2.3.1 GENERAL:**

- A. Perform throughout abatement work monitoring, inspection and testing inside and around the regulated area in accordance with the OSHA requirements and these specifications. The CPIH shall periodically inspect and oversee the performance of the Contractor IH Technician. The IH Technician shall continuously inspect and monitor conditions inside the regulated area to ensure compliance with these specifications. In addition, the CPIH shall personally manage air sample collection, analysis, and evaluation for personnel, regulated area, and adjacent area samples to satisfy OSHA requirements. Additional inspection and testing requirements are also indicated in other parts of this specification.
- B. The VA will employ an independent industrial hygienist (VPIH) consultant to perform various services on behalf of the VA. The VPIH will perform the necessary monitoring, inspection, testing, and other support services to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH consultant in no way relieves the Abatement Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the VPIH and their services will be borne by the VA except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Abatement Contractor.
- C. If fibers counted by the CPIH/VPIH during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified limits, the Abatement Contractor shall stop work. The Abatement Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the COTR representative. Cost for the confirmation of



results will be borne by the Abatement Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the responsibility of the CPIH with review and approval of the VPIH. An agreement between the CPIH and the VPIH shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples, location, collection, quality control on-site, analytical laboratory, interpretation of results and any follow-up actions. This written agreement shall be co-signed by the IH's and delivered to the VA's representative. Any air samples sent off-site must go to a NIST-NVLAP accredited laboratory.

#### **2.3.2 SCOPE OF SERVICES OF THE VPIH CONSULTANT:**

- A. The purpose of the work of the VPIH is to: Assure quality; resolve problems; and prevent the spread of contamination beyond the regulated area. In addition, their work includes performing the final visual inspection and air testing, if required, to determine whether the regulated area or building has been adequately decontaminated. If the State/Local requirements do not mandate a final clearance air sampling, a final air clearance may not be needed. All air monitoring is to be done utilizing PCM with an option to utilize TEM after approval from the VPIH. The VPIH will perform the following tasks:
1. Task 1: Perform air monitoring and visual inspection outside the regulated area during actual abatement work to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.
  2. Task 2: Perform unannounced visits to spot check overall compliance of work with contract/specifications. These visits may include any inspection, monitoring, and testing inside and outside the regulated area and all aspects of the operation except personnel monitoring.
  3. Task 3: Inspect the regulated areas to assure/certify that ACM left in place during the demolition activity did not become friable.
  4. Task 4: Provide support to the VA representative such as evaluation of submittals from the Abatement Contractor, resolution of unforeseen developments, etc.
  5. Task 5: Perform, in the presence of the VA representative, final inspection and testing, if needed, of a decontaminated regulated area or building at the conclusion of the abatement and clean-up work to certify compliance with the VA requirements.

6. Task 6: Issue certificate of decontamination for each regulated area or building.

- B. All data, inspection results and testing results generated by the VPIH will be available to the Abatement Contractor for information and consideration. The Abatement Contractor shall cooperate with and support the VPIH for efficient and smooth performance of their work.
- C. The monitoring and inspection results of the VPIH will be used by the VA to issue any stop removal orders to the Abatement Contractor during abatement work and to accept or reject a regulated area or building as decontaminated.
- D. All air sampling and analysis data will be recorded on VA Form 10-0018.

**2.3.3 MONITORING, INSPECTION AND TESTING BY ABATEMENT CONTRACTOR:**

The CPIH is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The CPIH is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Abatement Contractor's personnel and cause negative impact on the environment. The CPIH shall inspect the project and certify that ACM left in place during the abatement project did not become friable as a result of the abatement activity. Safety and health conditions and the provision of those conditions inside and outside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Abatement Contractor/Competent Person. The person performing the personnel and area air monitoring inside the regulated area shall be an IH Technician, who shall be trained and shall have specialized field experience in air sampling and analysis. The IH Technician shall have a NIOSH 582 Course or equivalent and show proof. The IH Technician shall participate in the AIHA Asbestos Analysis Registry or participate in the Proficiency Analytic Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA/State Contractor/Supervisor. The IH Technician shall have participated in five abatement projects collecting personal and area samples as well as responsibility for documentation. Ten (10)% of all samples analyzed in the field shall be sent to an AIHA accredited Laboratory for confirmation. The analytic laboratory used by the Abatement Contractor to analyze the samples shall be AIHA accredited for asbestos PAT. A daily log documenting all OSHA requirements for air

monitoring for asbestos in 29 CFR 1926.1101(f), (g) and Appendix A. This log shall be made available to the VA representative and the VPIH. The log will contain, at a minimum, information on personnel or area sampled, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. Take and analyze samples for each representative job being done in the regulated area, i.e., removal, wetting, clean-up, and load-out. No fewer than two personal samples per shift shall be collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift in the clean room area shall be collected. In addition to the continuous monitoring required, the CPIH will perform inspection during abatement to assure work practices are in accordance with the specification and that no ACM which is non-friable has become friable during the abatement work. Testing shall be done at the end of abatement for each regulated area or building as specified in the CPIH responsibilities. The work of the IH Technician shall be reviewed and certified by the CPIH.

#### **2.4 STANDARD OPERATING PROCEDURES:**

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

- A. Minimum Personnel Qualifications.
- B. Contingency Plans and Arrangements.
- C. Security and Safety Procedures.
- D. Respiratory Protection/Personal Protective Equipment Program and Training.
- E. Medical Surveillance Program and Recordkeeping.
- F. Regulated Area Requirements - Containment Barriers/Isolation of Regulated Area.
- G. Decontamination Facilities and Entry/Exit Procedures (PDF and EWDF).
- H. Negative Pressure Systems Requirements.
- I. Monitoring, Inspections, and Testing.
- J. Removal Procedures for RACM and ACE.

- K. Removal Procedures for RACM discovered during building demolition shall be provided as per NESHAP's.
- L. Removal of Contaminated Soil (if applicable).
- M. Disposal of RACM and ACE as per NESHAP's; OSHA; and DOT for friable asbestos including NESHAP's/DOT shipping papers example. Disposal requirements for non-friable waste as per OSHA requirements.
- N. Regulated Area Decontamination/Clean-up.
- O. Regulated Area Visual and Air Clearance, if required.
- P. Project Completion/Closeout.

## **2.5 SUBMITTALS:**

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

Submit to the VA a minimum of 14 days prior to the pre-construction meeting the following for review and approval. Meeting this requirement is a prerequisite for the pre-construction meeting for this project.

- A. Submit a detailed work schedule for the entire project reflecting contract documents and the phasing/schedule requirements from the CPM chart.
- B. Submit a staff organization chart showing all personnel who will be working on the project and their capacity/function. Provide their qualifications, training, accreditations, and licenses, as appropriate. Provide a copy of the "Certificate of Worker's Acknowledgment" and the "Affidavit of Medical Surveillance and Respiratory Protection" for each person.
- C. Submit Standard Operating Procedures developed specifically for this project, including the removal of RACM discovered during demolition, incorporating the requirements of the specifications, prepared, signed and dated by the CPIH.
- D. Submit the specifics of the materials and equipment to be used for this project with brand names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
  - 1. Negative air machines, HEPA vacuums, air monitoring pumps, calibration devices, pressure differential monitoring device and emergency power generating system.
  - 2. Waste water filtration system, shower system, containment barriers.
  - 3. Surfactants, hand held sprayers, airless sprayers, glovebags, fire extinguishers.
  - 4. Respirators, protective clothing, personal protective equipment.
  - 5. Fire safety equipment to be used in the regulated area.

- E. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of subcontractor, if used. Proof of asbestos training for transportation personnel shall be provided.
- F. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.
- G. Submit the name, location and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f) and Appendix A. Include the accreditation number of the Laboratory.
- H. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
  - 1. Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project:  
Project Name; Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; Completion Date
  - 2. List of project(s) halted by owner, A/E, IH, regulatory agency in the last 3 years:  
Project Name; Reason; Date; Reference Name/Number; Resolution
  - 3. List asbestos regulatory citations, penalties, damages paid and legal actions taken against the company in the last 3 years. Provide copies and all information needed for verification.
- I. Submit information on personnel: Provide a resume; address each item completely; provide references; phone numbers; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.20 and that the company has implemented a medical surveillance program and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.
  - 1. CPIH: Name; years of abatement experience; list of projects similar to this one; certificates, licenses, accreditations for proof of AHERA/OSHA specialized asbestos training; professional affiliations;

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

#### **2.5.2 SUBMITTALS DURING ABATEMENT:**

- A. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel entering/exiting the regulated area; document and discuss the resolution of unusual events such as barrier breeching, equipment failures, emergencies, and any cause for stopping work; representative air

monitoring and results/TWA's/EL's. Submit this daily log to VA's representative.

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

#### **2.5.3 SUBMITTALS AT COMPLETION OF ABATEMENT:**

The CPIH shall submit a project report consisting of the daily log book requirements and documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. The report shall include a certificate of completion, signed and dated by the CPIH, in accordance with Attachment #1. All clearance and perimeter samples must be submitted on VA Form 10-0018. The VA Representative will forward the abatement report to the Medical Center after completion of the project.

### **PART 3 - EXECUTION**

#### **3.1 PRE-ABATEMENT ACTIVITIES:**

##### **3.1.1 PRE-ABATEMENT MEETING:**

The VA representative, upon receipt, review, and substantial approval of all pre-abatement submittals and verification by the CPIH that all materials and equipment required for the project are on the site, will arrange for a pre-abatement meeting between the abatement contractor, the CPIH, Competent Person(s), the VA representative(s), and the VPIH. The purpose of the meeting is to discuss any aspect of the submittals needing clarification or amplification and to discuss any aspect of the project execution and the sequence of the operation. The abatement contractor shall be prepared to provide any supplemental information/documentation to the VA's representative regarding any submittals, documentation, materials or equipment. Upon satisfactory resolution of any outstanding issues, the VA's representative will issue a written order to proceed to the abatement contractor. No abatement work of any kind described in the following provisions shall be initiated prior to the VA written order to proceed.

### **3.1.2 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS:**

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

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

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

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

### **3.1.3 PRE-ABATEMENT CONSTRUCTION AND OPERATIONS:**

- A. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.
- B. Upon completion of all preparatory work, the CPIH will inspect the work and systems and will notify the VA's representative when the work is completed in accordance with this specification. The VA's representative may inspect the regulated area and the systems with the VPIH and may require that upon satisfactory inspection, the abatement contractor's employees perform all major aspects of the approved SOP's, especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory



operation. The operational systems for respiratory protection and the negative pressure system shall be demonstrated for proper performance.

- C. The CPIH shall document the pre-abatement activities described above and deliver a copy to the VA's representative.
- D. Upon satisfactory inspection of the installation of and operation of systems the VA's representative will notify the abatement contractor in writing to proceed with the asbestos abatement work in accordance with this specification.

### **3.2 REGULATED AREA PREPARATIONS:**

- A. Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted at a distance sufficiently far enough away from the regulated area to permit any personnel to read the sign and take the necessary measures to avoid exposure. Additional signs will be posted following construction of the regulated area enclosure.
- B. Shut down and lock out electric power to the regulated area. Provide temporary power and lighting. Insure safe installation including GFCI of temporary power sources and equipment by compliance with all applicable electrical code requirements and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.
- C. Shut down and lock out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area.
- D. The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.
- E. The VA will provide water for abatement purposes. The Contractor shall connect to the existing VA system. The service to the shower(s) shall be supplied with backflow prevention. The Contractor shall be responsible for hot water provision to the shower(s).
- F. The Contractor shall not allow unauthorized persons into the regulated area without the written permission of the VAIH.

### **3.3 CONTAINMENT COVERINGS FOR THE REGULATED AREA:**

#### **3.3.1 GENERAL:**

Seal off the perimeter of the regulated area to completely isolate the abatement project and to contain all airborne asbestos contamination created by the abatement activities. Should the adjacent area past the regulated area become contaminated due to improper work activities, the

abatement contractor shall suspend work inside the regulated area, continue wetting, and clean the adjacent areas in accordance with procedures described in these specifications. Any and all costs associated with the adjacent area cleanup shall not be borne by the VA.

**3.3.2 PREPARATION PRIOR TO SEALING OFF:**

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

**3.3.3 CONTROLLING ACCESS TO THE REGULATED AREA:**

Access to the regulated area shall be permitted only through the PDF. All other means of access shall be closed off by proper sealing and DANGER signs posted on the clean side of the regulated area where it is adjacent to or within view of any occupiable area. An opaque visual barrier of at least 4 mil poly shall be provided so that the abatement work is not visible to any building occupants. If the area adjacent to the regulated area is accessible to the public, construct a solid barrier on the public side of the sheeting for protection and isolation of the project. The barrier shall be constructed with nominal 2" x 4" (50mm x 100mm) wood or metal studs 16" (400mm) on centers, securely anchored to prevent movement and covered with a minimum of 1/2" (12.5mm) plywood. Provide an appropriate number of OSHA DANGER signs for each visual and physical barrier. Any alternative method must be given a written approval by the VA's representative.

**3.3.4 CRITICAL BARRIERS:**

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

the poly to the wall/surface. Locate plywood squares at each end, corner, and 4' (1200mm) maximum on centers.

#### **3.3.5 PRIMARY/SECONDARY BARRIERS:**

- A. Floors: Cover the floor of the regulated area with at least two layers of 6 mil fire retardant poly, turning up the walls at least 12" (300mm). The poly must form a right angle at the floor-wall juncture so there is no radius which can be stepped on, possibly causing detachment of the poly. Spray glue and duct tape must both be used for floor seams. Floor seams must overlap a minimum of 6 feet (1800mm) or be at right angles to each other. The top sheet of poly must be able to be removed independently of the bottom layer. A third loose layer of 6 mil poly shall be used in the area of removal and periodically picked up to reduce contamination of the initial layers.
- B. Walls: All walls in the regulated area, including critical barriers, shall be covered with 2 layers of 4 mil fire retardant poly, mechanically supported and sealed with duct tape and/or spray glue. Tape all joints, including the floor-wall joint, with duct tape/spray glue. All wall joints must overlap at least 6 feet (1800mm).
- C. Stairs and Ramps: Stairs or ramps covered in poly must be provided with 3/4" (36mm) exterior grade plywood treads securely held in place over the poly. Do not cover stairs or ramps with unsecured poly. Do not cover rungs or rails with any protective materials.

#### **3.3.6 EXTENSION OF THE REGULATED AREA:**

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

#### **3.4 REMOVAL OF RACM AND ACE:**

##### **3.4.1 WETTING MATERIALS:**

- A. Use amended water for the wetting of ACM prior to removal. The Competent Person shall assure the wetting of ACM meets the definition of "adequately wet" in the EPA NESHAP's regulation for the duration of the

project. A removal encapsulant may be used instead of amended water with written approval of the VA's representative.

- B. Amended Water: Provide water to which a surfactant has been added shall be used to wet the ACM and reduce the potential for fiber release during disturbance of ACM. The mixture must be equal to or greater than the wetting provided by water amended by a surfactant consisting one ounce of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with 5 gallons (19L) of water.

#### **3.4.2 WET REMOVAL OF ACM:**

- A. Adequately and thoroughly wet the ACM to be removed prior to removal to reduce/prevent fiber release to the air. Adequate time must be allowed for the amended water to saturate the ACM. Abatement personnel must not disturb dry ACM. Use a fine spray of amended water or removal encapsulant. Saturate the material sufficiently to wet to the substrate without causing excessive dripping. The material must be sprayed repeatedly/continuously during the removal process in order to maintain adequately wet conditions. Perforate or carefully separate, using wet methods, an outer covering that is painted or jacketed in order to allow penetration and wetting of the material. Where necessary, carefully remove covering while wetting to minimize fiber release. In no event shall dry removal occur except in the case of electrical hazards or a greater safety issue is possible!
- B. If ACM does not wet well with amended water due to coating or jacketing, remove as follows:
  - 1. Mist regulated area continuously with amended water whenever necessary to reduce airborne fiber levels.
  - 2. Remove saturated ACM in small sections. Do not allow material to dry out. As material is removed, bag material while still wet into disposal bags. Twist tightly the bag neck, bend over (gooseneck) and seal with a minimum of three tight wraps of duct tape. Clean/decontaminate the outside of any residue and move to washdown station adjacent to EWDF.
  - 3. Fireproofing or Architectural Finish on Scratch Coat: Spray with a fine mist of amended water or removal encapsulant. Allow time for saturation to the substrate. Do not oversaturate causing excess dripping. Scrape material from substrate. Remove material in manageable quantities and control falling to staging or floor. If the falling distance is over 20 feet (6M), use a drop chute to contain material through descent. Remove residue remaining on the scratch

coat after scraping is done using a stiff bristle hand brush. If a removal encapsulant is used, remove residue completely before the encapsulant dries. Re-wet the substrate as needed to prevent drying before the residue is removed.

4. Fireproofing or Architectural Finish on Wire Lath: Spray with a fine mist of amended water or removal encapsulant. Allow time to completely saturate the material. Do not oversaturate causing excess dripping. If the surface has been painted or otherwise coated, cut small holes as needed and apply amended water or removal encapsulant from above. Cut saturated wire lath into 2' x 6' (50mm x 150mm) sections and cut hanger wires. Roll up complete with ACM, cover in burlap and hand place in disposal bag. Do not drop to floor. After removal of lath/ACM, remove any overspray on decking and structure using stiff bristle nylon brushes. Depending on hardness of overspray, scrapers may be needed for removal.
5. Pipe Insulation: Remove the outer layer of wrap while spraying with amended water in order to saturate the ACM. Spray ACM with a fine mist of amended water or removal encapsulant. Allow time to saturate the material to the substrate. Cut bands holding pre-formed pipe insulation sections. Slit jacketing at the seams, remove and hand place in a disposal bag. Do not allow dropping to the floor. Remove molded fitting insulation/mud in large pieces and hand place in a disposal bag. Remove any residue on pipe or fitting with a stiff bristle nylon brush. In locations where pipe fitting insulation is removed from fibrous glass or other non-asbestos insulated straight runs of pipe, remove fibrous material at least 6" from the point it contacts the ACM.

#### **3.4.3 GLOVEBAG REMOVAL PROCEDURES**

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

### **3.5 DISPOSAL OF RACM AND ACE WASTE MATERIALS:**

#### **3.5.1 GENERAL:**

Dispose of waste RACM/ACE and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Disposal shall be done at an approved facility. Disposal of non-friable ACM/ACE shall be done in accordance

with applicable regulations. Some States regulate RACM as hazardous waste and manifesting the RACM would be required.

#### **3.5.2 PROCEDURES:**

- A. RACM waste shall be packaged and moved through the EWDF into a covered transport container in accordance with procedures in this specification. Waste shall be double-bagged prior to disposal. Wetted waste can be very heavy. Bags shall not be overfilled. Bags shall securely sealed to prevent accidental opening and/or leakage. The top shall be tightly twisted and goosenecked prior to tightly sealing with at least three wraps of duct tape. Ensure that unauthorized persons do not have access to the waste material once it is outside the regulated area. All transport containers must be covered at all times when not in use. NESHA's signs must be on containers during loading and unloading. Material shall not be transported in open vehicles. If drums are used for packaging, the drums shall be labeled properly and shall not be re-used.
- B. Waste Load Out: Waste load out shall be done in accordance with the procedures in EWDF Decontamination Procedures. Bags shall be decontaminated on exterior surfaces by wet cleaning and/or HEPA vacuuming before being placed in the second bag.
- C. Asbestos waste with sharp edged components, i.e., nails, screws, lath, strapping, tin sheeting, jacketing, metal mesh, etc., which might tear poly bags shall be wrapped securely in burlap before packaging and, if needed, use a poly lined fiber drum as the second container, prior to disposal.

#### **3.6 PROJECT DECONTAMINATION:**

##### **3.6.1 GENERAL:**

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

##### **3.6.2 REGULATED AREA CLEARANCE:**

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

##### **3.6.3 WORK DESCRIPTION:**

Decontamination includes the cleaning and clearance of the air in the regulated area and the decontamination and removal of the enclosures/facilities installed prior to the abatement work including

primary/critical barriers, PDF and EWDF facilities, and negative pressure systems.

#### **3.6.4 PRE-DECONTAMINATION CONDITIONS:**

- A. Before decontamination starts, all ACM and ACE from the regulated area shall be removed, all waste collected and removed, and the secondary barrier of poly removed and disposed of along with any gross debris generated by the work.
- B. At the start of decontamination, the following shall be in place:
  - 1. Primary barriers consisting of two layers of 6 mil poly on the floor and on the walls.
  - 2. Critical barriers consisting of two layers of 6 mil poly which is the sole barrier between the regulated area and the rest of the building or outside.
  - 3. Critical barrier poly over lighting fixtures, clocks, HVAC openings, doorways, windows, convectors, speakers and other openings in the regulated area.
  - 4. Decontamination facilities for personnel and equipment in operating condition and the negative pressure system in operation.

#### **3.6.5 CLEANING:**

Clean all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping methods. Use each surface of a cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible residue from abated surfaces or poly or other surfaces. Remove all filters in the air handling system and dispose of as ACM waste in accordance with these specifications. The negative pressure system shall remain in operation during this time. If determined by the CPIH/VPIH additional cleaning(s) may be needed.

#### **3.7 VISUAL INSPECTION AND AIR CLEARANCE TESTING:**

##### **3.7.1 GENERAL:**

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

### **3.7.2 VISUAL INSPECTION:**

Visual inspection will include the entire regulated area, the PDF, all poly sheeting, seals over HVAC openings, doorways, windows, and any other openings. If any debris, residue, dust or any other suspect material is detected, the final cleaning shall be repeated at no cost to the VA. Dust/material samples may be collected and analyzed at no cost to the VA at the discretion of the VPIH to confirm visual findings. When the regulated area is visually clean the final testing can be done.

### **3.7.3 AIR CLEARANCE TESTING:**

- A. Since the areas will not be re-occupied by personnel after the completion of the abatement, air clearance testing is not required under OSHA/EPA AHERA. States may have rules for clearance testing that might require testing. Consult State rules for the facility and perform clearance testing if needed. After an acceptable visual inspection by the VPIH and VA Representative, the VPIH will perform the final testing. If the release criteria are not met, the Abatement Contractor shall repeat the final cleaning and continue decontamination procedures. Additional inspection and testing will be done at the expense of the Abatement Contractor.
- B. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

### **3.7.4 AIR CLEARANCE PROCEDURES:**

- A. Contractor's Release Criteria: Work in a regulated area is complete when the regulated area is visually clean and airborne fiber levels have been reduced to or below 0.01 f/cc as measured with PCM methods, if required.
- B. Final Clearance Sampling: If required, the VPIH will secure samples and analyze them according to the NIOSH 7400 method. Samples must be confirmed at an AIHA accredited laboratory if samples are analyzed on-site.

### **3.7.5 CLEARANCE SAMPLING USING PCM:**

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



### **3.8 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE:**

#### **3.8.1 COMPLETION OF ABATEMENT WORK:**

A. After thorough decontamination, seal negative air machines with 2 layers of 6 mil poly and duct tape to form a tight seal at the intake/outlet ends before removal from the regulated area. Complete asbestos abatement work upon meeting the regulated area clearance criteria and fulfilling the following:

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

#### **3.8.2 CERTIFICATE OF COMPLETION BY CONTRACTOR:**

The CPIH shall complete and sign the "Certificate of Completion" in accordance with Attachment 1 at the completion of the abatement and decontamination of the regulated area.

#### **3.8.3 WORK SHIFTS:**

All work shall be done during administrative hours (8:00 AM to 4:30 PM) Monday -Friday excluding Federal Holidays. Any change in the work schedule must be approved in writing by the VA Representative.

**ATTACHMENT #1**

**CERTIFICATE OF COMPLETION**

DATE:

PROJECT NAME:

VAMC/ADDRESS:

1. I certify that I have personally inspected, monitored and supervised the abatement work of (specify regulated area or Building):

which took place from to

2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.

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

3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.
4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.
5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.
6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum fiber count never exceeded 0.5 f/cc, except as described below.

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

Signature/Date:

Signature/Date:

**ATTACHMENT #2**

**CERTIFICATE OF WORKER'S ACKNOWLEDGMENT**

PROJECT NAME:

DATE:

PROJECT ADDRESS:

ABATEMENT CONTRACTOR'S NAME:

**WORKING WITH ASBESTOS CAN BE HAZARDOUS TO YOUR HEALTH. INHALING ASBESTOS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCERS. IF YOU SMOKE AND INHALE ASBESTOS FIBERS YOUR CHANCES OF DEVELOPING LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.**

Your employer's contract with the owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of the equipment found at an asbestos abatement project. You must receive/have a current medical examination for working with asbestos. These things shall be provided at no cost to you. By signing this certificate you are indicating to the owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by a third party, State/EPA accredited trainer in the requirements for an AHERA/OSHA Asbestos Abatement Worker training course, 32 hours minimum duration. I currently have a valid State accreditation certificate. The topics covered in the course include, as a minimum, the following:

Physical Characteristics and Background Information on Asbestos

Potential Health Effects Related to Exposure to Asbestos

Employee Personal Protective Equipment

Establishment of a Respiratory Protection Program

State of the Art Work Practices

Personal Hygiene

Additional Safety Hazards

Medical Monitoring

Air Monitoring

Relevant Federal, State and Local Regulatory Requirements, Procedures,  
and Standards

Asbestos Waste Disposal

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, occupational history, pulmonary function test, and may have included a chest x-ray evaluation. The physician issued a positive written opinion after the examination.

Signature:

Printed Name:

Social Security Number:

Witness:

**ATTACHMENT #3**

**AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND  
TRAINING/ACCREDITATION**

VA PROJECT NAME AND NUMBER:

VA MEDICAL FACILITY:

ABATEMENT CONTRACTOR'S NAME AND ADDRESS:

1. I verify that the following individual

Name:

Social Security Number:

Who is proposed to be employed in asbestos abatement work associated with the above project by the named Abatement Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.1101(m), and that complete records of the medical surveillance program as required by 29 CFR 1926.1101(m)(n) and 29 CFR 1910.20 are kept at the offices of the Abatement Contractor at the following address.

Address:

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.
3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.
4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH:

Date:

Printed Name of CPIH:

Signature of Contractor:

Date:

Printed Name of Contractor:

**ATTACHMENT #4**

**ABATEMENT CONTRACTOR'S REVIEW AND ACCEPTANCE OF SPECIFICATIONS**

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

I, the undersigned, have read this entire specification regarding the abatement activities. I understand the requirements of the specifications and agree to follow the specifications as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the specifications and have been given an opportunity to ask any questions regarding the specifications content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of this specification.

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

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Abatement Contractor Owner's Signature

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Abatement Contractor Competent Person(s)

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- - END- - -



**SECTION 03 30 00**  
**CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 RELATED WORK:**

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

**1.3 TESTING AGENCY FOR CONCRETE MIX DESIGN:**

- A. Testing agency retained and reimbursed by the Contractor and approved by Resident Engineer.
- B. Testing agency maintaining active participation in Program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology.
- C. Testing agency shall furnish equipment and qualified technicians to establish proportions of ingredients for concrete mixes.

**1.4 TOLERANCES:**

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

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

#### **1.5 REGULATORY REQUIREMENTS:**

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

#### **1.6 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Shop Drawings: Reinforcing steel: Complete shop drawings
- C. Mill Test Reports:
  1. Reinforcing Steel.
  2. Cement.
- D. Manufacturer's Certificates:
  1. Abrasive aggregate.
  2. Lightweight aggregate for structural concrete.
  3. Air-entraining admixture.
  4. Chemical admixtures, including chloride ion content.
  5. Waterproof paper for curing concrete.
  6. Liquid membrane-forming compounds for curing concrete.
  7. Non-shrinking grout.
  8. Liquid hardener.
  9. Waterstops.
  10. Expansion joint filler.
  11. Adhesive binder.
- E. Testing Agency for Concrete Mix Design: Approval request including qualifications of principals and technicians and evidence of active participation in program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology.
- F. Test Report for Concrete Mix Designs.

#### **1.7 DELIVERY, STORAGE, AND HANDLING:**

- A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.

- B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least 300 mm (1 foot) above ground.
- C. Deliver other packaged materials for use in concrete in original sealed containers, plainly marked with manufacturer's name and brand, and protect from damage until used.

#### **1.8 PRE-CONCRETE CONFERENCE:**

- A. General: At least 15 days prior to submittal of design mixes, conduct a meeting to review proposed methods of concrete construction to achieve the required results.
- B. Agenda: Includes but is not limited to:
  - 1. Submittals.
  - 2. Coordination of work.
  - 3. Availability of material.
  - 4. Concrete mix design including admixtures.
  - 5. Methods of placing, finishing, and curing.
  - 6. Finish criteria required to obtain required flatness and levelness.
  - 7. Timing of floor finish measurements.
  - 8. Material inspection and testing.
- C. Attendees: Include but not limited to representatives of Contractor; subcontractors involved in supplying, conveying, placing, finishing, and curing concrete; lightweight aggregate manufacturer; admixture manufacturers; Resident Engineer; Consulting Engineer; Department of Veterans Affairs retained testing laboratories for concrete testing and finish (F-number) verification.
- D. Minutes of the meeting: Contractor shall take minutes and type and distribute the minutes to attendees within five days of the meeting.

#### **1.9 MOCK-UP:**

- A. In addition to the other specified samples and tests, construct a mock-up using the materials, reinforcing, forming system and construction methods proposed for use in exposed architectural concrete.
- B. Construct the mock-up with at least a 2.5 m by 2.5 m (8 feet by 8 feet) exposed surface and suitable foundations. Include the following where applicable: Control joints, reglets, recesses or other typical architectural details.
- C. Before casting the mock-up, submit full detailed Shop Drawings of the mock-up formwork for review by the Architect. Perform all necessary preliminary tests to ensure that concrete used for the mock-up will exactly match the approved sample in color and texture.

- D. Perform the surface treatment proposed for use on one or more areas not less than 300 mm by 300 mm (1 foot by 1 foot) on the back side of the mock-up to establish the texture of finish required by the Architect. Repeat as required until a sample satisfactory to the Architect has been obtained.
- E. Treat the finished front surface of the mock-up to produce a uniform appearance similar in every respect to the approved sample area.
- F. The completed mock-up shall be inspected by the Architect. Failure of the mock-up to match the approved sample will require the construction of further mock-ups until approval is obtained. Remove rejected mock-ups immediately.
- G. Maintain the approved mock-ups in good condition at the job site until all architectural concrete surfaces have been completed and approved by the Architect. Remove the mock-up from the site after completion of the above.

#### **1.10 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
  - 117-06.....Tolerances for Concrete Construction and  
Materials
  - 211.1-02.....Selecting Proportions for Normal Weight Concrete
  - 211.2-04.....Selecting Proportions for Structural Lightweight  
Concrete
  - 214R-02.....Evaluation of Strength Test Results of Concrete
  - 301-05.....Structural Concrete
  - 304R-2000.....Guide for Measuring, Mixing, Transporting, and  
Placing Concrete
  - 305R-06.....Hot Weather Concreting
  - 306R-(2002).....Cold Weather Concreting
  - 308R-(2001).....Standard Practice for Curing Concrete
  - 309R-05.....Guide for Consolidation of Concrete
  - 31808.....Building Code Requirements for Reinforced  
Concrete and Commentary
  - 347R-04.....Guide to Formwork for Concrete
  - SP-66-04.....ACI Detailing Manual
- C. American National Standards Institute and American Hardboard Association (ANSI/AHA):
  - A135.4-2004.....Basic Hardboard
- D. American Society for Testing and Materials (ASTM):

A82/A82M-07.....Steel Wire, Plain, for Concrete Reinforcement  
A185/185M-07.....Steel Welded Wire Fabric, Plain, for Concrete  
Reinforcement  
A615/A615M-08.....Deformed and Plain Billet-Steel Bars for  
Concrete Reinforcement  
C31/C31M-08.....Making and Curing Concrete Test Specimens in the  
field  
C33-07.....Concrete Aggregates  
C39/C39M-05.....Compressive Strength of Cylindrical Concrete  
Specimens  
C143/C143M-05.....Slump of Hydraulic Cement Concrete  
C150-07.....Portland Cement  
C171-07.....Sheet Materials for Curing Concrete  
C172-07.....Sampling Freshly Mixed Concrete  
C173-07.....Air Content of Freshly Mixed Concrete by the  
Volumetric Method  
C192/C192M-07.....Making and Curing Concrete Test Specimens in the  
Laboratory  
C231-08.....Air Content of Freshly Mixed Concrete by the  
Pressure Method  
C260-06.....Air-Entraining Admixtures for Concrete  
C309-07.....Liquid Membrane-Forming Compounds for Curing  
Concrete  
C330-05.....Lightweight Aggregates for Structural Concrete  
C494/C494M-08.....Chemical Admixtures for Concrete  
C496-06.....Splitting Tensile Strength of Cylindrical  
Concrete Specimens  
C567-05.....Density of Structural Lightweight Concrete  
C618-08.....Coal Fly Ash and Raw or Calcined Natural  
Pozzolan for Use as a Mineral Admixture in  
Concrete  
C666/C666M-03.....Resistance of Concrete to Rapid Freezing and  
Thawing  
C1107/1107M-07.....Packaged Dry, Hydraulic-Cement Grout (Non-  
shrink)  
C1315-08 .....Liquid Membrane-Forming Compounds Having Special  
Properties for Curing and Sealing Concrete  
D1751-04.....Preformed Expansion Joint Filler for Concrete  
Paving and Structural Construction (Non-  
extruding and Resilient Bituminous Types)

D4397-02.....Polyethylene Sheeting for Construction,  
Industrial and Agricultural Applications  
E1155-96(R2008).....Determining  $F_F$  Floor Flatness and  $F_L$  Floor  
Levelness Numbers

E. American Welding Society (AWS):

D1.4-05.....Structural Welding Code - Reinforcing Steel

F. Concrete Reinforcing Steel Institute (CRSI):

Handbook 2008

G. U. S. Department of Commerce Product Standard (PS):

PS 1.....Construction and Industrial Plywood

PS 20.....American Softwood Lumber

## **PART 2 - PRODUCTS:**

### **2.1 FORMS:**

- A. Wood: PS 20 free from loose knots and suitable to facilitate finishing concrete surface specified; tongue and grooved.
- B. Plywood: PS-1 Exterior Grade B-B (concrete-form) 16 mm (5/8 inch), or 20 mm (3/4 inch) thick for unlined contact form.
- C. Metal for Concrete Rib-Type Construction: Steel (removal type) of suitable weight and form to provide required rigidity.
- D. Permanent Steel Form for Concrete Slabs: Corrugated, ASTM A653, Grade E, and Galvanized, ASTM A653, G90. Provide venting where insulating concrete fill is used.
- E. Form Ties: Develop a minimum working strength of 13.35 kN (3000 pounds) when fully assembled. Ties shall be adjustable in length to permit tightening of forms and not have any lugs, cones, washers to act as spreader within form, nor leave a hole larger than 20 mm (3/4 inch) diameter, or a depression in exposed concrete surface, or leave metal closer than 40 mm (1 1/2 inches) to concrete surface. Wire ties not permitted. Cutting ties back from concrete face not permitted.

### **2.2 MATERIALS:**

- A. Portland Cement: ASTM C150 Type I or II.
- B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalies, and loss on ignition (LOI) not to exceed 5 percent.
- C. Coarse Aggregate: ASTM C33.
  - 1. Size 67 or Size 467 may be used for footings and walls over 300 mm (12 inches) thick.
  - 2. Coarse aggregate for applied topping, encasement of steel columns, and metal pan stair fill shall be Size 7.
  - 3. Maximum size of coarse aggregates not more than one-fifth of narrowest dimension between sides of forms, one-third of depth of

slabs, nor three-fourth of minimum clear spacing between reinforcing bars.

D. Lightweight Aggregates for Structural Concrete: ASTM C330, Table 1.

Maximum size of aggregate not larger than one-fifth of narrowest dimension between forms, nor three-fourth of minimum clear distance between reinforcing bars. Contractor to furnish certified report to verify that aggregate is sound and durable, and has a durability factor of not less than 80 based on 300 cycles of freezing and thawing when tested in accordance with ASTM C666.

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

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

G. Admixtures:

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

H. Vapor Barrier: ASTM D4397, 0.25 mm (10 mil).

I. Reinforcing Steel: ASTM A615, or ASTM A996, deformed, grade as shown.

J. Welded Wire Fabric: ASTM A185.

K. Reinforcement for Metal Pan Stair Fill: 50 mm (2 inch) wire mesh, either hexagonal mesh at .8Kg/m<sup>2</sup> (1.5 pounds per square yard), or square mesh at .6Kg/m<sup>2</sup> (1.17 pounds per square yard).

- L. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.
- M. Expansion Joint Filler: ASTM D1751.
- N. Sheet Materials for Curing Concrete: ASTM C171.
- O. Liquid Membrane-forming Compounds for Curing Concrete: ASTM C309, Type I, with fugitive dye. Compound shall be compatible with scheduled surface treatment, such as paint and resilient tile, and shall not discolor concrete surface.
- P. Moisture Vapor Emissions & Alkalinity Control Sealer: 100% active colorless aqueous silicate solution concrete surface treatment applied the day of the concrete pour in lieu of other curing methods for all concrete slabs receiving resilient flooring, such as, sheet vinyl, vinyl composition tile, rubber, wood flooring, carpet, epoxy coatings and overlays .

ASTM C1315 Type 1 Class A, and ASTM C309 Type 1 Class A, penetrating product to have no less than 34% solid content, leaving no sheen, volatile organic compound (VOC) content rating as required to suite regulatory requirements. The product shall have at least a five (5) year documented history in controlling moisture vapor emission from damaging floor covering, compatible with all finish materials.

#### MVE 15-Year Warranty

When a floor covering is installed on a below grade, on grade, or above grade concrete slab treated with Moisture Vapor Emissions & Alkalinity Control Sealer according to manufacturer's instruction, sealer manufacturer shall warrant the floor covering system against failure due to moisture vapor migration or moisture-born contaminants for a period of fifteen (15) years from the date of original installation. The warranty shall cover all labor and materials needed to replace all floor covering that fails due to moisture vapor emission & moisture born contaminants.

- Q. Penetrating Sealer: For use on parking garage ramps and decks. High penetration silane sealer providing minimum 95 percent screening per National Cooperative Highway Research Program (NCHRP) No. 244 standards for chloride ion penetration resistance. Requires moist (non-membrane) curing of slab.
- R. Non-Shrink Grout:
  - 1. ASTM C1107, pre-mixed, produce a compressive strength of at least 18 MPa at three days and 35 MPa (5000 psi) at 28 days. Furnish test data



from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 1200 mm x 1200 mm (4 foot by 4 foot) base plate.

S. Adhesive Binder: ASTM C881.

1. Polyvinyl Chloride Waterstop: CRD C572.
2. Rubber Waterstops: CRD C513.
3. Bentonite Water Stop: Flexible strip of bentonite 25 mm x 20 mm (1 inch by 3/4 inch), weighing 8.7 kg/m (5.85 lbs. per foot) composed of Butyl Rubber Hydrocarbon (ASTM D297), Bentonite (SS-S-210-A) and Volatile Matter (ASTM D6).
4. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).

## 2.3 CONCRETE MIXES:

**TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE**

Concrete Strength		Non-Air-Entrained	Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/m <sup>3</sup> (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m <sup>3</sup> (lbs/c. yd)	Max. Water Cement Ratio
35 (5000) <sup>1,3</sup>	375 (630)	0.45	385 (650)	0.40
30 (4000) <sup>1,3</sup>	325 (550)	0.55	340 (570)	0.50
25 (3000) <sup>1,3</sup>	280 (470)	0.65	290 (490)	0.55
25 (3000) <sup>1,2</sup>	300 (500)	*	310 (520)	*

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f'c.

A. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II.

**TABLE II - MAXIMUM SLUMP, MM (INCHES) \***

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

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

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

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

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

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

- C. Durability: Use air entrainment for exterior exposed concrete subjected to freezing and thawing and other concrete shown or specified. Air content as shown in Table III or Table IV.
- D. Enforcing Strength Requirements: Test as specified in Section 01 45 29, TESTING LABORATORY SERVICES, during the progress of the work. Seven-day tests may be used as indicators of 28-day strength. Average of any three 28-day consecutive strength tests of laboratory-cured specimens representing each type of concrete shall be equal to or greater than specified strength. No single test shall be more than 3.5 MPa (500 psi) below specified strength. Interpret field test results in accordance with ACI 214. Should strengths shown by test specimens fall below required values, Resident Engineer may require any one or any combination of the following corrective actions, at no additional cost to the Government:

1. Require changes in mix proportions by selecting one of the other appropriate trial mixes or changing proportions, including cement content, of approved trial mix.
2. Require additional curing and protection.
3. If five consecutive tests fall below 95 percent of minimum values given in Table I or if test results are so low as to raise a question as to the safety of the structure, Resident Engineer may direct Contractor to take cores from portions of the structure. Use results from cores tested by the Contractor retained testing agency to analyze structure.
4. If strength of core drilled specimens falls below 85 percent of minimum value given in Table I, Resident Engineer may order load tests, made by Contractor retained testing agency, on portions of building so affected. Load tests in accordance with ACI 318 and criteria of acceptability of concrete under test as given therein.
5. Concrete work, judged inadequate by structural analysis, by results of load test, or for any reason, shall be reinforced with additional construction or replaced, if directed by the Resident Engineer.

#### **2.4 BATCHING AND MIXING:**

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

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

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

control of mixes to produce concrete of required quality.

Representative shall assist and advise Resident Engineer.

### **PART 3 - EXECUTION**

#### **3.1 FORMWORK:**

- A. General: Design in accordance with ACI 347 is the responsibility of the Contractor. The Contractor shall retain a registered Professional Engineer to design the formwork, shores, and reshores.
  - 1. Form boards and plywood forms may be reused for contact surfaces of exposed concrete only if thoroughly cleaned, patched, and repaired and Resident Engineer approves their reuse.
  - 2. Provide forms for concrete footings unless Resident Engineer determines forms are not necessary.
  - 3. Corrugated fiberboard forms: Place forms on a smooth firm bed, set tight, with no buckled cartons to prevent horizontal displacement, and in a dry condition when concrete is placed.
- B. Treating and Wetting: Treat or wet contact forms as follows:
  - 1. Coat plywood and board forms with non-staining form sealer. In hot weather, cool forms by wetting with cool water just before concrete is placed.
  - 2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather, cool metal forms by thoroughly wetting with water just before placing concrete.
  - 3. Use sealer on reused plywood forms as specified for new material.
- C. Size and Spacing of Studs: Size and space studs, wales and other framing members for wall forms so as not to exceed safe working stress of kind of lumber used nor to develop deflection greater than  $1/270$  of free span of member.
- D. Unlined Forms: Use plywood forms to obtain a smooth finish for concrete surfaces. Tightly butt edges of sheets to prevent leakage. Back up all vertical joints solidly and nail edges of adjacent sheets to same stud with 6d box nails spaced not over 150 mm (6 inches) apart.
- E. Lined Forms: May be used in lieu of unlined plywood forms. Back up form lining solidly with square edge board lumber securely nailed to studs with all edges in close contact to prevent bulging of lining. No joints in lining and backing may coincide. Nail abutted edges of sheets to same backing board. Nail lining at not over 200 mm (8 inches) on center along edges and with at least one nail to each square foot of surface area; nails to be 3d blued shingle or similar nails with thin flatheads.
- F. Architectural Liner: Attach liner as recommended by the manufacturer with tight joints to prevent leakage.

G. Wall Form Ties: Locate wall form ties in symmetrically level horizontal rows at each line of wales and in plumb vertical tiers. Space ties to maintain true, plumb surfaces. Provide one row of ties within 150 mm (6 inches) above each construction joint. Space through-ties adjacent to horizontal and vertical construction joints not over 450 mm (18 inches) on center.

1. Tighten row of ties at bottom of form just before placing concrete and, if necessary, during placing of concrete to prevent seepage of concrete and to obtain a clean line. Ties to be entirely removed shall be loosened 24 hours after concrete is placed and shall be pulled from least important face when removed.
2. Coat surfaces of all metal that is to be removed with paraffin, cup grease or a suitable compound to facilitate removal.

H. Inserts, Sleeves, and Similar Items: Flashing reglets, steel strips, masonry ties, anchors, wood blocks, nailing strips, grounds, inserts, wire hangers, sleeves, drains, guard angles, forms for floor hinge boxes, inserts or bond blocks for elevator guide rails and supports, and other items specified as furnished under this and other sections of specifications and required to be in their final position at time concrete is placed shall be properly located, accurately positioned, and built into construction, and maintained securely in place.

1. Locate inserts or hanger wires for furred and suspended ceilings only in bottom of concrete joists, or similar concrete member of overhead concrete joist construction.
2. Install sleeves, inserts and similar items for mechanical services in accordance with drawings prepared specially for mechanical services. Contractor is responsible for accuracy and completeness of drawings and shall coordinate requirements for mechanical services and equipment.
3. Do not install sleeves in beams, joists or columns except where shown or permitted by Resident Engineer. Install sleeves in beams, joists, or columns that are not shown, but are permitted by the Resident Engineer, and require no structural changes, at no additional cost to the Government.
4. Minimum clear distance of embedded items such as conduit and pipe is at least three times diameter of conduit or pipe, except at stub-ups and other similar locations.
5. Provide recesses and blockouts in floor slabs for door closers and other hardware as necessary in accordance with manufacturer's instructions.

I. Construction Tolerances:

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

### **3.2 PLACING REINFORCEMENT:**

- A. General: Details of concrete reinforcement in accordance with ACI 318 and ACI 315, unless otherwise shown.
- B. Placing: Place reinforcement conforming to CRSI DA4, unless otherwise shown.
  1. Place reinforcing bars accurately and tie securely at intersections and splices with 1.6 mm (16 gauge) black annealed wire. Secure reinforcing bars against displacement during the placing of concrete by spacers, chairs, or other similar supports. Portions of supports, spacers, and chairs in contact with formwork shall be made of plastic in areas that will be exposed when building is occupied. Type, number, and spacing of supports conform to ACI 315. Where concrete slabs are placed on ground, use concrete blocks or other non-corrodible material of proper height, for support of reinforcement. Use of brick or stone supports will not be permitted.
  2. Lap welded wire fabric at least 1 1/2 mesh panels plus end extension of wires not less than 300 mm (12 inches) in structural slabs. Lap welded wire fabric at least 1/2 mesh panels plus end extension of wires not less than 150 mm (6 inches) in slabs on grade.
  3. Splice column steel at no points other than at footings and floor levels unless otherwise shown.
- C. Spacing: Minimum clear distances between parallel bars, except in columns and multiple layers of bars in beams shall be equal to nominal diameter of bars. Minimum clear spacing is 25 mm (1 inch) or 1-1/3 times maximum size of coarse aggregate.
- D. Splicing: Splices of reinforcement made only as required or shown or specified. Accomplish splicing as follows:
  1. Lap splices: Do not use lap splices for bars larger than Number 36 (Number 11). Minimum lengths of lap as shown.

2. Welded splices: Splicing by butt-welding of reinforcement permitted providing the weld develops in tension at least 125 percent of the yield strength (fy) for the bars. Welding conform to the requirements of AWS D1.4. Welded reinforcing steel conform to the chemical analysis requirements of AWS D1.4.
  - a. Submit test reports indicating the chemical analysis to establish weldability of reinforcing steel.
  - b. Submit a field quality control procedure to insure proper inspection, materials and welding procedure for welded splices.
  - c. Department of Veterans Affairs retained testing agency shall test a minimum of three splices, for compliance, locations selected by Resident Engineer.
3. Mechanical Splices: Develop in tension and compression at least 125 percent of the yield strength (fy) of the bars. Stresses of transition splices between two reinforcing bar sizes based on area of smaller bar. Provide mechanical splices at locations indicated. Use approved exothermic, tapered threaded coupling, or swaged and threaded sleeve. Exposed threads and swaging in the field not permitted.
  - a. Initial qualification: In the presence of Resident Engineer, make three test mechanical splices of each bar size proposed to be spliced. Department of Veterans Affairs retained testing laboratory will perform load test.
  - b. During installation: Furnish, at no additional cost to the Government, one companion (sister) splice for every 50 splices for load testing. Department of Veterans Affairs retained testing laboratory will perform the load test.
- E. Bending: Bend bars cold, unless otherwise approved. Do not field bend bars partially embedded in concrete, except when approved by Resident Engineer.
- F. Cleaning: Metal reinforcement, at time concrete is placed, shall be free from loose flaky rust, mud, oil, or similar coatings that will reduce bond.
- G. Future Bonding: Protect exposed reinforcement bars intended for bonding with future work by wrapping with felt and coating felt with a bituminous compound unless otherwise shown.

### **3.3 VAPOR BARRIER:**

- A. Except where membrane waterproofing is required, interior concrete slab on grade shall be placed on a continuous vapor barrier.
  1. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.

2. Vapor barrier joints lapped 150 mm (6 inches) and sealed with compatible waterproof pressure-sensitive tape.
3. Patch punctures and tears.

#### **3.4 MOISTURE VAPOR EMISSIONS & ALKALINITY CONTROL SEALER:**

- A. Sealer is applied on the day of the concrete pour or as as soon as harsh weather permits, prior to any other chemical treatments for concrete slabs either on grade, below grade or above grade receiving resilient flooring, such as, sheet vinyl, vinyl composition tile, rubber, wood flooring, carpet, epoxy coatings and overlays.
- B. Manufacturer's representative will be on the site the day of concrete pour to install or train its application and document. He shall return on every application thereafter to verify that proper procedures are followed.
  1. Apply Sealer to concrete slabs as soon as final finishing operations are complete and the concrete has hardened sufficiently to sustain floor traffic without damage.
  2. Spray apply Sealer at the rate of 20 m<sup>2</sup> (200 square feet) per gallon. Lightly broom product evenly over the substrate and product has completely penetrated the surface.
  3. If within two (2) hours after initial application areas are subjected to heavy rainfall and puddling occurs, reapply Sealer product to these areas as soon as weather condition permits.

#### **3.5 CONSTRUCTION JOINTS:**

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



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

### **3.6 EXPANSION JOINTS:**

- A. Clean expansion joint surfaces before installing premolded filler and placing adjacent concrete.
- B. Install polyvinyl chloride or rubber water seals, as shown in accordance with manufacturer's instructions, to form continuous watertight seal.

### **3.7 PLACING CONCRETE:**

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

C. Conveying Concrete: Convey concrete from mixer to final place of deposit by a method which will prevent segregation. Method of conveying concrete subject to approval of Resident Engineer.

D. Placing: For special requirements see Paragraphs, HOT WEATHER and COLD WEATHER.

1. Do not place concrete when weather conditions prevent proper placement and consolidation, or when concrete has attained its initial set, or has contained its water or cement content more than 1 1/2 hours.
2. Deposit concrete in forms as near as practicable in its final position. Prevent splashing of forms or reinforcement with concrete in advance of placing concrete.
3. Do not drop concrete freely more than 3000 mm (10 feet) for concrete containing the high-range water-reducing admixture (superplasticizer) or 1500 mm (5 feet) for conventional concrete. Where greater drops are required, use a tremie or flexible spout (canvas elephant trunk), attached to a suitable hopper.
4. Discharge contents of tremies or flexible spouts in horizontal layers not exceeding 500 mm (20 inches) in thickness, and space tremies such as to provide a minimum of lateral movement of concrete.
5. Continuously place concrete until an entire unit between construction joints is placed. Rate and method of placing concrete shall be such that no concrete between construction joints will be deposited upon or against partly set concrete, after it's initial set has taken place, or after 45 minutes of elapsed time during concrete placement.
6. On bottom of members with severe congestion of reinforcement, deposit 25 mm (1 inch) layer of flowing concrete containing the specified high-range water-reducing admixture (superplasticizer). Successive concrete lifts may be a continuation of this concrete or concrete with a conventional slump.
7. Concrete on metal deck:
  - a. Concrete on metal deck shall be minimum thickness shown. Allow for deflection of steel beams and metal deck under the weight of wet concrete in calculating concrete quantities for slab.
    - 1) The Contractor shall become familiar with deflection characteristics of structural frame to include proper amount of additional concrete due to beam/deck deflection.

E. Consolidation: Conform to ACI 309. Immediately after depositing, spade concrete next to forms, work around reinforcement and into angles of forms, tamp lightly by hand, and compact with mechanical vibrator applied directly into concrete at approximately 450 mm (18 inch)

intervals. Mechanical vibrator shall be power driven, hand operated type with minimum frequency of 5000 cycles per minute having an intensity sufficient to cause flow or settlement of concrete into place. Vibrate concrete to produce thorough compaction, complete embedment of reinforcement and concrete of uniform and maximum density without segregation of mix. Do not transport concrete in forms by vibration.

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

### **3.8 HOT WEATHER:**

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

### **3.9 COLD WEATHER:**

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

### **3.10 PROTECTION AND CURING:**

- A. Conform to ACI 308: Initial curing shall immediately follow the finishing operation. Protect exposed surfaces of concrete from premature drying, wash by rain and running water, wind, mechanical injury, and excessively hot or cold temperatures. Keep concrete not covered with membrane or other curing material continuously wet for at least 7 days after placing, except wet curing period for high-early-strength concrete shall be not less than 3 days. Keep wood forms continuously wet to prevent moisture loss until forms are removed. Cure exposed concrete surfaces as described below. Other curing methods may be used if approved by Resident Engineer.

1. Liquid curing and sealing compounds: Apply by power-driven spray or roller in accordance with the manufacturer's instructions. Apply immediately after finishing. Maximum coverage 10m<sup>2</sup>/L (400 square feet per gallon) on steel troweled surfaces and 7.5m<sup>2</sup>/L (300 square feet

- per gallon) on floated or broomed surfaces for the curing/sealing compound.
2. Plastic sheets: Apply as soon as concrete has hardened sufficiently to prevent surface damage. Utilize widest practical width sheet and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with tape.
  3. Paper: Utilize widest practical width paper and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with sand, wood planks, pressure-sensitive tape, mastic or glue.

### **3.11 REMOVAL OF FORMS:**

- A. Remove in a manner to assure complete safety of structure after the following conditions have been met.
  1. Where structure as a whole is supported on shores, forms for beams and girder sides, columns, and similar vertical structural members may be removed after 24 hours, provided concrete has hardened sufficiently to prevent surface damage and curing is continued without any lapse in time as specified for exposed surfaces.
  2. Take particular care in removing forms of architectural exposed concrete to insure surfaces are not marred or gouged, and that corners and arises are true, sharp and unbroken.
- B. Reshoring: Reshoring is required if superimposed load plus dead load of the floor exceeds the capacity of the floor at the time of loading. In addition, for flat slab/plate, reshoring is required immediately after stripping operations are complete and not later than the end of the same day. Reshoring accomplished in accordance with ACI 347 at no additional cost to the Government.

### **3.12 CONCRETE SURFACE PREPARATION:**

- A. Metal Removal: Unnecessary metal items cut back flush with face of concrete members.
- B. Patching: Maintain curing and start patching as soon as forms are removed. Do not apply curing compounds to concrete surfaces requiring patching until patching is completed. Use cement mortar for patching of same composition as that used in concrete. Use white or gray Portland cement as necessary to obtain finish color matching surrounding concrete. Thoroughly clean areas to be patched. Cut out honeycombed or otherwise defective areas to solid concrete to a depth of not less than 25 mm (1 inch). Cut edge perpendicular to surface of concrete. Saturate with water area to be patched, and at least 150 mm (6 inches) surrounding before placing patching mortar. Give area to be patched a brush coat of cement grout followed immediately by patching mortar. Cement grout composed of one part Portland cement, 1.5 parts fine sand,

bonding admixture, and water at a 50:50 ratio, mix to achieve consistency of thick paint. Mix patching mortar approximately 1 hour before placing and remix occasionally during this period without addition of water. Compact mortar into place and screed slightly higher than surrounding surface. After initial shrinkage has occurred, finish to match color and texture of adjoining surfaces. Cure patches as specified for other concrete. Fill form tie holes which extend entirely through walls from unexposed face by means of a pressure gun or other suitable device to force mortar through wall. Wipe excess mortar off exposed face with a cloth.

- C. Upon removal of forms, clean vertical concrete surface that is to receive bonded applied cementitious application with wire brushes or by sand blasting to remove unset material, laitance, and loose particles to expose aggregates to provide a clean, firm, granular surface for bond of applied finish.

### **3.13 CONCRETE FINISHES:**

#### **A. Vertical and Overhead Surface Finishes:**

1. Unfinished areas: Vertical and overhead concrete surfaces exposed in pipe basements, elevator and dumbwaiter shafts, pipe spaces, pipe trenches, above suspended ceilings, manholes, and other unfinished areas will not require additional finishing.
2. Interior and exterior exposed areas to be painted: Remove fins, burrs and similar projections on surfaces flush, and smooth by mechanical means approved by Resident Engineer, and by rubbing lightly with a fine abrasive stone or hone. Use ample water during rubbing without working up a lather of mortar or changing texture of concrete.
3. Interior and exterior exposed areas finished: Give a grout finish of uniform color and smooth finish treated as follows:
  - a. After concrete has hardened and laitance, fins and burrs removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone stone.
  - b. Apply grout composed of one part of Portland cement, one part fine sand, smaller than a 600  $\mu\text{m}$  (No. 30) sieve. Work grout into surface of concrete with cork floats or fiber brushes until all pits, and honeycombs are filled.
  - c. After grout has hardened slightly, but while still plastic, scrape grout off with a sponge rubber float and, about 1 hour later, rub concrete vigorously with burlap to remove any excess grout remaining on surfaces.

- d. In hot, dry weather use a fog spray to keep grout wet during setting period. Complete finish of area in same day. Make limits of finished areas at natural breaks in wall surface. Leave no grout on concrete surface overnight.
- 4. Textured: Finish as specified. Maximum quantity of patched area 0.2 m<sup>2</sup> (2 square feet) in each 93 m<sup>2</sup> (1000 square feet) of textured surface.

B. Slab Finishes:

- 1. Monitoring and Adjustment: Provide continuous cycle of placement, measurement, evaluation and adjustment of procedures to produce slabs within specified tolerances. Monitor elevations of structural steel in key locations before and after concrete placement to establish typical deflection patterns for the structural steel. Determine elevations of cast-in-place slab soffits prior to removal of shores. Provide information to Resident Engineer and floor consultant for evaluation and recommendations for subsequent placements.
- 2. Set perimeter forms to serve as screed using either optical or laser instruments. For slabs on grade, wet screeds may be used to establish initial grade during strike-off, unless Resident Engineer determines that the method is proving insufficient to meet required finish tolerances and directs use of rigid screed guides. Where wet screeds are allowed, they shall be placed using grade stakes set by optical or laser instruments. Use rigid screed guides, as opposed to wet screeds, to control strike-off elevation for all types of elevated (non slab-on-grade) slabs. Divide bays into halves or thirds by hard screeds. Adjust as necessary where monitoring of previous placements indicates unshored structural steel deflections to other than a level profile.
- 3. Place slabs monolithically. Once slab placement commences, complete finishing operations within same day. Slope finished slab to floor drains where they occur, whether shown or not.
- 4. Use straightedges specifically made for screeding, such as hollow magnesium straightedges or power strike-offs. Do not use pieces of dimensioned lumber. Strike off and screed slab to a true surface at required elevations. Use optical or laser instruments to check concrete finished surface grade after strike-off. Repeat strike-off as necessary. Complete screeding before any excess moisture or bleeding water is present on surface. Do not sprinkle dry cement on the surface.

5. Immediately following screeding, and before any bleed water appears, use a 3000 mm (10 foot) wide highway straightedge in a cutting and filling operation to achieve surface flatness. Do not use bull floats or darbys, except that darbying may be allowed for narrow slabs and restricted spaces.
6. Wait until water sheen disappears and surface stiffens before proceeding further. Do not perform subsequent operations until concrete will sustain foot pressure with maximum of 6 mm (1/4 inch) indentation.
7. Scratch Finish: Finish base slab to receive a bonded applied cementitious application as indicated above, except that bull floats and darbys may be used. Thoroughly coarse wire broom within two hours after placing to roughen slab surface to insure a permanent bond between base slab and applied materials.
8. Float Finish: Slabs to receive unbonded toppings, steel trowel finish, fill, mortar setting beds, or a built-up roof, and ramps, stair treads, platforms (interior and exterior), and equipment pads shall be floated to a smooth, dense uniform, sandy textured finish. During floating, while surface is still soft, check surface for flatness using a 3000 mm (10 foot) highway straightedge. Correct high spots by cutting down and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections and re-float to a uniform texture.
9. Steel Trowel Finish: Concrete surfaces to receive resilient floor covering or carpet, monolithic floor slabs to be exposed to view in finished work, future floor roof slabs, applied toppings, and other interior surfaces for which no other finish is indicated. Steel trowel immediately following floating. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure to compact cement paste and form a dense, smooth surface. Finished surface shall be smooth, free of trowel marks, and uniform in texture and appearance.
10. Broom Finish: Finish exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after surfaces have been floated. Brush in a direction transverse to main traffic. Match texture approved by Resident Engineer from sample panel.
11. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:
  - a. Areas covered with carpeting, or not specified otherwise in b. below:  
Slab on Grade:

Specified overall value                      F<sub>F</sub> 25/F<sub>L</sub> 20  
Minimum local value                          F<sub>F</sub> 17/F<sub>L</sub> 15  
Level suspended slabs (shored until after testing) and topping  
slabs:

Specified overall value                      FF 25/FL 20  
Minimum local value                          FF 17/FL 15

Unshored suspended slabs:

Specified overall value                      FF 25  
Minimum local value                          FF 17

Level tolerance such that 80 percent of all points fall within a  
20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch)  
from the design elevation.

- b. Areas that will be exposed, receive thin-set tile or resilient  
flooring, or roof areas designed as future floors:

Slab on grade:

Specified overall value                      FF 36/FL 20  
Minimum local value                          FF 24/FL 15

Level suspended slabs (shored until after testing) and topping  
slabs

Specified overall value                      FF 30/FL 20  
Minimum local value                          FF 24/FL 15

Unshored suspended slabs:

Specified overall value                      FF 30  
Minimum local value                          FF 24

Level tolerance such that 80 percent of all points fall within a  
20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch)  
from the design elevation.

- c. "Specified overall value" is based on the composite of all  
measured values in a placement derived in accordance with ASTM  
E1155.
- d. "Minimum local value" (MLV) describes the flatness or levelness  
below which repair or replacement is required. MLV is based on the  
results of an individual placement and applies to a minimum local  
area. Minimum local area boundaries may not cross a construction  
joint or expansion joint. A minimum local area will be bounded by  
construction and/or control joints, or by column lines and/or  
half-column lines, whichever is smaller.

## 12. Measurements

- a. Department of Veterans Affairs retained testing laboratory will  
take measurements as directed by Resident Engineer, to verify  
compliance with F<sub>F</sub>, F<sub>L</sub>, and other finish requirements.



Measurements will occur within 72 hours after completion of concrete placement (weekends and holidays excluded). Make measurements before shores or forms are removed to insure the "as-built" levelness is accurately assessed. Profile data for above characteristics may be collected using a laser level or any Type II apparatus (ASTM E1155, "profileograph" or "dipstick"). Contractor's surveyor shall establish reference elevations to be used by Department of Veterans Affairs retained testing laboratory.

- b. Contractor not experienced in using  $F_F$  and  $F_L$  criteria is encouraged to retain the services of a floor consultant to assist with recommendations concerning adjustments to slab thicknesses, finishing techniques, and procedures on measurements of the finish as it progresses in order to achieve the specific flatness and levelness numbers.
13. Acceptance/ Rejection:
- a. If individual slab section measures less than either of specified minimum local  $F_F/F_L$  numbers, that section shall be rejected and remedial measures shall be required. Sectional boundaries may be set at construction and contraction (control) joints, and not smaller than one-half bay.
  - b. If composite value of entire slab installation, combination of all local results, measures less than either of specified overall  $F_F/F_L$  numbers, then whole slab shall be rejected and remedial measures shall be required.
14. Remedial Measures for Rejected Slabs: Correct rejected slab areas by grinding, planing, surface repair with underlayment compound or repair topping, retopping, or removal and replacement of entire rejected slab areas, as directed by Resident Engineer, until a slab finish constructed within specified tolerances is accepted.

#### **3.14 SURFACE TREATMENTS:**

- A. Use on exposed concrete floors and concrete floors to receive carpeting except those specified to receive non-slip finish.
- B. Liquid Densifier/Sealer: Apply in accordance with manufacturer's directions just prior to completion of construction.
- C. Non-Slip Finish: Except where safety nosing and tread coverings are shown, apply non-slip abrasive aggregate to treads and platforms of concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms. Broadcast aggregate uniformly over concrete surface at rate of application of 8% per 1/10th  $m^2$  (7.5 percent per square foot) of area. Trowel concrete surface to smooth dense finish. After curing, rub

treated surface with abrasive brick and water to slightly expose abrasive aggregate.

**3.15 APPLIED TOPPING:**

- A. Separate concrete topping on floor base slab of thickness and strength shown. Topping mix shall have a maximum slump of 200 mm (8 inches) for concrete containing a high-range water-reducing admixture (superplasticizer) and 100 mm (4 inches) for conventional mix. Neatly bevel or slope at door openings and at slabs adjoining spaces not receiving an applied finish.
- B. Placing: Place continuously until entire section is complete, struck off with straightedge, leveled with a highway straightedge or highway bull float, floated and troweled by machine to a hard dense finish. Slope to floor drains as required. Do not start floating until free water has disappeared and no water sheen is visible. Allow drying of surface moisture naturally. Do not hasten by "dusting" with cement or sand.

**3.16 RESURFACING FLOORS:**

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

**3.17 RETAINING WALLS:**

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

- - - E N D - - -

**SECTION 04 05 13**  
**MASONRY MORTARING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

Section specifies mortar materials and mixes.

**1.2 RELATED WORK:**

A. Mortar used in Section:

1. Section 04 05 16, MASONRY GROUTING.
2. Section 04 20 00, UNIT MASONRY.
3. Section 04 72 00, CAST STONE MASONRY.

B. Mortar Color: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 TESTING LABORATORY-CONTRACTOR RETAINED**

- A. Engage a commercial testing laboratory approved by COTR to perform tests specified below.
- B. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to COTR.

**1.4 TESTS**

- A. Test mortar and materials specified.
- B. Certified test reports.
- C. Identify materials by type, brand name and manufacturer or by origin.
- D. Do not use materials until laboratory test reports are approved by COTR.
- E. After tests have been made and materials approved, do not change without additional test and approval of COTR.
- F. Testing:
  1. Test materials proposed for use for compliance with specifications in accordance with test methods contained in referenced specifications and as follows:
  2. Mortar:
    - a. Test for compressive strength and water retention; ASTM C270.
    - b. Mortar compressive strengths 28 days as follows:  
Type M: Minimum 17230 kPa (2500 psi) at 28 days.  
Type S: Minimum 12400 kPa (1800 psi) at 28 days.  
Type N: Minimum 5170 kPa (750 psi) at 28 days.
  3. Cement:
    - a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
    - b. Nonstaining cement shall contain not more than 0.03 percent water soluble alkali.

4. Sand: Test for deleterious substances, organic impurities, soundness and grading.

G. TESTING LABORATORY SERVICES, takes and tests samples as specified in that section. Testing procedures and test methods in ASTM C780.

#### **1.5 SUBMITTALS**

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Certificates:

1. Testing laboratory's facilities and qualifications of its technical personnel.

2. Indicating that following items meet specifications:

a. Portland cement.

b. Masonry cement.

c. Mortar cement.

d. Hydrated lime.

e. Fine aggregate (sand).

g. Color admixture.

C. Laboratory Test Reports:

1. Mortar, each type.

2. Admixtures.

D. Manufacturer's Literature and Data:

1. Cement, each kind.

2. Hydrated lime.

3. Admixtures.

4. Liquid acrylic resin.

#### **1.6 PRODUCT DELIVERY, STORAGE AND HANDLING**

A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents.

B. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

#### **1.7 APPLICABLE PUBLICATIONS**

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

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

C40-04.....Organic Impurities in Fine Aggregates for  
Concrete

C91-05.....Masonry Cement

C109-07.....	Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-MM Cube Specimens)
C144-04.....	Aggregate for Masonry Mortar
C150-05.....	Portland Cement
C207-06.....	Hydrated Lime for Masonry Purposes
C270-07.....	Mortar for Unit Masonry
C307-03.....	Tensile Strength of Chemical - Resistant Mortar, Grouts, and Monolithic Surfacing
C321-00/R05.....	Bond Strength of Chemical-Resistant Mortars
C348-02.....	Flexural Strength of Hydraulic Cement Mortars
C595-08.....	Blended Hydraulic Cement
C780-07.....	Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C979-05.....	Pigments for Integrally Colored Concrete
C1329-05.....	Mortar Cement

## **PART 2 - PRODUCTS**

### **2.1 HYDRATED LIME**

ASTM C207, Type S.

### **2.2 AGGREGATE FOR MASONRY MORTAR**

A. ASTM C144 and as follows:

1. Light colored sand for mortar for laying face brick.
2. White plastering sand meeting sieve analysis for mortar joints for pointing.

B. Test sand for color value in accordance with ASTM C40. Sand producing color darker than specified standard is unacceptable.

### **2.3 BLENDED HYDRAULIC CEMENT**

ASTM C595, Type IS, IP.

### **2.4 MASONRY CEMENT**

A. ASTM C91. Type N, S, or M.

B. Use white masonry cement whenever white mortar is specified.

### **2.5 MORTAR CEMENT**

ASTM C1329, Type N, S or M.

### **2.6 PORTLAND CEMENT**

A. ASTM C150, Type I.

B. Use white Portland cement wherever white mortar is specified.

### **2.7 LIQUID ACRYLIC RESIN**

A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.

## **2.8 WATER**

Potable, free of substances that are detrimental to mortar, masonry, and metal.

## **2.9 POINTING MORTAR**

For Cast Stone: Proportion by volume; One part white Portland cement, two parts white sand, and 1/5 part hydrated lime.

## **2.10 MASONRY MORTAR**

A. Conform to ASTM C270.

B. Admixtures:

1. Do not use mortar admixtures, except for high bond mortar, and color admixtures unless approved by COTR.
2. Submit laboratory test report showing effect of proposed admixture on strength, water retention, and water repellency of mortar.
3. Do not use antifreeze compounds.

C. Colored Mortar:

1. Maintain uniform mortar color for exposed work throughout.
2. Match mortar color in approved sample or mock-up.
3. Color of mortar for exposed work in alteration work to match color of existing mortar unless specified otherwise in section 09 06 00, SCHEDULE FOR FINISHES.

D. Color Admixtures:

1. Proportion as specified by manufacturer.
2. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.

## **PART 3 - EXECUTION**

### **3.1 MIXING**

A. Mix in a mechanically operated mortar mixer.

1. Mix mortar for at least three minutes but not more than five minutes.

B. Measure ingredients by volume. Measure by the use of a container of known capacity.

C. Mix water with dry ingredients in sufficient amount to provide a workable mixture which will adhere to vertical surfaces of masonry units.

D. Mortar that has stiffened because of loss of water through evaporations:

1. Re-tempered by adding water to restore to proper consistency and workability.
2. Discard mortar that has reached its initial set or has not been used within two hours.

E. Pointing Mortar:

1. Mix dry ingredients with enough water to produce a damp mixture of workable consistency which will retain its shape when formed into a ball.
2. Allow mortar to stand in dampened condition for one to 1-1/2 hours.
3. Add water to bring mortar to a workable consistency prior to application.

**3.2 MORTAR USE LOCATION**

- A. Use Type M mortar for waterproof parging below grade.
- B. Use Type S mortar for masonry containing vertical reinforcing bars (non-engineered) masonry below grade and setting cast stone.
- C. Use Type N mortar for other masonry work, except as otherwise specified.
- D. Use Type N mortar for tuck pointing work.
- E. Use pointing mortar for items specified.

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**SECTION 04 05 16**  
**MASONRY GROUTING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

Section specifies grout materials and mixes.

**1.2 RELATED WORK:**

A. Grout used in Section:

1. Section 04 20 00, UNIT MASONRY.
2. Section 04 72 00, CAST STONE MASONRY.

B. Grout Color: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 TESTS:**

A. Test grout and materials specified.

B. Certified test reports.

C. Identify materials by type, brand name and manufacturer or by origin.

D. Do not use materials until laboratory test reports are approved by COTR.

E. After tests have been made and materials approved, do not change without additional test and approval of COTR.

F. Testing:

1. Test materials proposed for use for compliance with specifications in accordance with test methods contained in referenced specifications and as follows:

2. Grout:

- a. Test for compressive strength; ASTM C1019.
- b. Grout compressive strength of 13790 kPa (2000 psi) at 28 days.

3. Cement:

- a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
- b. Nonstaining cement shall contain not more than 0.03 percent water soluble alkali.

4. Sand: Test for deleterious substances, organic impurities, soundness and grading.

**1.4 SUBMITTALS:**

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Certificates:

1. Indicating that following items meet specifications:
  - a. Portland cement.
  - b. Masonry cement.



- c. Grout.
- d. Hydrated lime.
- e. Fine aggregate (sand).
- C. Laboratory Test Reports:
  - 1. Grout, each type.
  - 2. Admixtures.
- D. Manufacturer's Literature and Data:
  - 1. Cement, each kind.
  - 2. Hydrated lime.
  - 3. Admixtures.
  - 4. Liquid acrylic resin.

#### **1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:**

- A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents.
- B. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

#### **1.6 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - C40-04.....Organic Impurities in Fine Aggregates for  
Concrete
  - C91-05.....Masonry Cement
  - C150-05.....Portland Cement
  - C207-06.....Hydrated Lime for Masonry Purposes
  - C404-07.....Aggregate for Masonry Grout
  - C476-07.....Grout for Masonry
  - C595-08.....Blended Hydraulic Cement
  - C979-05.....Pigments for Integrally Colored Concrete
  - C1019-05.....Sampling and Testing Grout

### **PART 2 - PRODUCTS**

#### **2.1 HYDRATED LIME:**

ASTM C207, Type S.

#### **2.2 AGGREGATE FOR MASONRY GROUT:**

ASTM C404, Size 8.

#### **2.3 BLENDED HYDRAULIC CEMENT:**

ASTM C595, Type IS, IP.

**2.4 MASONRY CEMENT:**

ASTM C91. Type N, S, or M.

**2.5 PORTLAND CEMENT:**

ASTM C150, Type I.

**2.6 LIQUID ACRYLIC RESIN:**

A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.

**2.7 WATER:**

Potable, free of substances that are detrimental to grout, masonry, and metal.

**2.8 GROUT:**

A. Conform to ASTM C476 except as specified.

B. Grout type proportioned by volume as follows:

1. Fine Grout:

a. Portland cement or blended hydraulic cement: one part.

b. Hydrated lime: 0 to 1/10 part.

c. Fine aggregate: 2-1/4 to three times sum of volumes of cement and lime used.

2. Coarse Grout:

a. Portland cement or blended hydraulic cement: one part.

b. Hydrated lime: 0 to 1/10 part.

c. Fine aggregate: 2-1/4 to three times sum of volumes of cement and lime used.

d. Coarse aggregate: one to two times sum of volumes of cement and lime used.

3. Sum of volumes of fine and coarse aggregates: Do not exceed four times sum of volumes of cement and lime used.

**2.9 COLOR ADMIXTURE:**

A. Pigments: ASTM C979.

B. Use mineral pigments only. Organic pigments are not acceptable.

C. Pigments inert, stable to atmospheric conditions, nonfading, alkali resistant and water insoluble.

**PART 3 - EXECUTION****3.1 MIXING:**

A. Mix in a mechanically operated grout mixer.

1. Mix grout for at least five minutes.

B. Measure ingredients by volume. Measure by the use of a container of known capacity.

- C. Mix water with grout dry ingredients in sufficient amount to bring grout mixture to a pouring consistency.

### **3.2 GROUT USE LOCATIONS:**

- A. Use fine grout for filling wall cavities and cells of concrete masonry units where the smallest dimension is 50 mm (2 inches) or less.
- B. Use either fine grout or coarse grout for filling wall cavities and cells of concrete masonry units where the smallest dimension is greater than 50 mm (2 inches).
- C. Do not use grout for filling bond beam or lintel units.

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**SECTION 04 20 00**  
**UNIT MASONRY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies requirements for construction of masonry unit walls.

**1.2 RELATED WORK**

- A. Mortars and grouts: Section 04 05 13, MASONRY MORTARING, Section 04 05 16, MASONRY GROUTING.
- B. Cast stone veneers: Section 04 72 00, CAST STONE MASONRY.
- C. Steel lintels: Section 05 50 00, METAL FABRICATIONS.
- D. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.
- E. Sealants and sealant installation: Section 07 92 00, JOINT SEALANTS.
- F. Color and texture of masonry units: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Samples:
  - 1. Concrete masonry units, when exposed in finish work, including samples of ground-faced cmu.
  - 2. Anchors, and ties, one each and joint reinforcing 1200 mm (48 inches) long.
- C. Shop Drawings:
  - 1. Special masonry shapes.
  - 2. Drawings, showing reinforcement, applicable dimensions and methods of hanging soffit or lintel masonry and reinforcing masonry for embedment of anchors for hung fixtures.
  - 3. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcing bars. Comply with ACI 315. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.
- D. Certificates:
  - 1. Certificates signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.

2. Indicating that the following items meet specification requirements:
  - a. Solid and load-bearing concrete masonry units, including fire-resistant rated units.
3. Testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.

E. Manufacturer's Literature and Data:

1. Anchors, ties, and reinforcement.
2. Shear keys.
3. Reinforcing bars.

#### 1.4 WARRANTY

Warrant exterior masonry walls against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21.

#### 1.5 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):

A951-06.....Steel Wire for Masonry Joint Reinforcement.

A615/A615M-07.....Deformed and Plain Billet-Steel Bars for  
Concrete Reinforcement.

A675/A675M-03.....Standard Specification for Steel Bars,Special  
Quality

C55-06.....Concrete Building Brick

C62-05.....Building Brick (Solid Masonry Units Made From  
Clay or Shale)

C67-07.....Sampling and Testing Brick and Structural Clay  
Tile

C90-06.....Load-Bearing Concrete Masonry Units

C476-02.....Standard Specification for Grout for Masonry

C612-04.....Mineral Fiber Block and Board Thermal Insulation

F1667-05.....Fasteners: Nails, Spikes and Staples

C. Masonry Industry Council:

All Weather Masonry Construction Manual, 2000.

D. American Welding Society (AWS):

D1.4-05        Structural Welding Code - Reinforcing Steel.

E. Federal Specifications (FS):

FF-S-107C-00.....Screws, Tapping and Drive

G. Masonry Standards Joint Committee; Specifications for Masonry Structures  
(ACI 530.1-05/ASCE 6-05/TMS 602-99) (MSJC).

## **PART 2 - PRODUCTS**

### **2.1 CONCRETE MASONRY UNITS**

- A. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.
  - 1. Unit Weight: Normal weight.
  - 2. Fire rated units for fire rated partitions.
  - 3. Sizes: Modular.
  - 4. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.
- B. Concrete Brick: ASTM C55.
- C. Ground-Face Concrete Block: ASTM C90.
  - 1. Unit Compressive Strength: Provide units with average net-area compressive strength of 2150 psi.
  - 2. Density Classification: Normal weight.
  - 3. Size (Width): Manufactured to dimensions shown on the drawings.
  - 4. Pattern and Texture: Standard pattern, ground-face finish. Match sample to be selected.
  - 5. Colors: As selected by COTR and Architect.

### **2.2 REINFORCEMENT:**

- A. Steel Reinforcing Bars: ASTM A615, deformed bars, 420 MPa (Grade 60) for bars No. 10 to No. 57 (No. 3 to No. 18), except as otherwise indicated.
- B. Where 6 mm diameter (No. 2) bars are shown, provide plain, round, carbon steel bars, ASTM A675, 550 MPa (Grade 80).
- C. Shop-fabricate reinforcement bars which are shown to be bent or hooked.
- D. Joint Reinforcement:
  - 1. Form from wire complying with ASTM A951.
  - 2. Galvanized after fabrication.
  - 3. Width of joint reinforcement 40 mm (1 5/8-inches) less than nominal width of masonry wall or partition.
  - 4. Cross wires welded to longitudinal wires.
  - 5. Joint reinforcing at least 3000 mm (10 feet) in length.
  - 6. Joint reinforcing in rolls is not acceptable.
  - 7. Joint reinforcing that is crimped to form drip is not acceptable.

8. Maximum spacing of cross wires 400 mm (16 inches) to longitudinal wires.
9. Ladder Design:
  - a. Longitudinal wires deformed 4 mm (0.16 inch) diameter wire.
  - b. Cross wires 2.6 mm (0.10 inch) diameter.
10. Trussed Design:
  - a. Longitudinal and cross wires not less than 4 mm (0.16 inch nominal) diameter.
  - b. Longitudinal wires deformed.
11. Multiple Wythes and Cavity wall ties:
  - a. Longitudinal wires 2.6 mm (0.10 inch), two in each wythe with ladder truss wires 2.6 mm (0.10 inch) overlay, welded to each longitudinal wire.
  - b. Longitudinal wires 4 mm (0.16 inch) with U shape 2.6 mm (0.10 inch) rectangular ties extending into other wythe not less than 75 mm (3 inches) spaced 400 mm o.c. (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches) minimum.

### **2.3 ANCHORS, TIES, AND REINFORCEMENT**

- A. Steel Reinforcing Bars: ASTM A615M, deformed bars, grade as shown.
- B. Joint Reinforcement:
  1. Form from wire complying with ASTM A951.
  2. Galvanized after fabrication.
  3. Width of joint reinforcement 40 mm (0.16 inches) less than nominal width of masonry wall or partition.
  4. Cross wires welded to longitudinal wires.
  5. Joint reinforcement at least 3000 mm (10 feet) in length.
  6. Joint reinforcement in rolls is not acceptable.
  7. Joint reinforcement that is crimped to form drip is not acceptable.
  8. Maximum spacing of cross wires 400 mm (16 inch) to longitudinal wires.
  9. Ladder Design:
    - a. Longitudinal wires deformed 4 mm (0.16 inch)diameter wire.
    - b. Cross wires 2.6 mm (0.10 inch)diameter.
  10. Trussed Design:
    - a. Longitudinal and cross wires not less than 4 mm (0.16 inch nominal) diameter.
  11. Multiple Wythes and Cavity wall ties:

- a. Longitudinal wires 4 mm (0.16 inch), two in each wythe with ladder truss wires 4 mm (0.16 inch) overlay, welded to each longitudinal wire.
- b. Longitudinal wires 4 mm (0.16 inch) with U shape 4 mm (0.16 inch) rectangular ties extending into other wythe not less than 75 mm (3 inches) spaced 400 mm o.c. (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches min.).

C. Dovetail Anchors:

1. Corrugated steel dovetail anchors formed of 1.5 mm (0.0598 inch) thick by 25 mm (1 inch) wide galvanized steel, 90 mm (3-1/2 inches) long where used to anchor 100 mm (4 inch) nominal thick masonry units, 140 mm (5-1/2 inches) long for masonry units more than 100 mm (4 inches) thick.
2. Triangular wire dovetail anchor 100 mm (4 inch) wide formed of 4 mm (9 gage) steel wire with galvanized steel dovetail insert. Anchor length to extend at least 75 mm (3 inches) into masonry, 25 mm (1 inch) into 40 mm (1-1/2 inch) thick units.
3. Form dovetail anchor slots from 0.6 mm (0.0239 inch) thick galvanized steel (with felt or fiber filler).

D. Individual ties:

1. Rectangular ties: Form from 5 mm (3/16 inch) diameter galvanized steel rod to a rectangular shape not less than 50 mm (2 inches) wide by sufficient length for ends of ties to extend within 25 mm (1 inch) of each face of wall. Ties that are crimped to form drip are not permitted.
2. Adjustable Cavity Wall Ties:
  - a. Adjustable wall ties may be used at Contractor's option.
  - b. Two piece type permitting up to 40 mm (1-1/2 inch) adjustment.
  - c. Form ties from 5 mm (3/16 inch) diameter galvanized steel wire.
  - d. Form one piece to a rectangular shape 105 mm (4-1/8 inches) wide by length required to extend into the bed joint 50 mm (2 inches).
  - e. Form the other piece to a 75 mm (3 inch) long by 75 mm (3 inch) wide shape, having a 75 mm (3 inch) long bent section for engaging the 105 mm (4-1/8 inch) wide piece to form adjustable connection.

E. Wall Ties, (Mesh or Wire):



1. Mesh wall ties formed of ASTM A82, W0.5, 2 mm, (16 gage) galvanized steel wire 13 mm by 13 mm (1/2 inch by 1/2 inch) mesh, 75 mm (3 inches) wide by 200 mm (8 inches) long.
2. Rectangular wire wall ties formed of W1.4, 3 mm, (9 gage) galvanized steel wire 50 mm (2 inches) wide by 200 mm (8 inches) long.

F. Corrugated Wall Tie:

1. Form from 1.5 mm (0.0598 inch) thick corrugated, galvanized steel 30 mm (1-1/4 inches) wide by lengths so as to extend at least 100 mm (4 inches) into joints of new masonry plus 38 mm (1-1/2 inch) turn-up.
2. Provide 5 mm (3/16 inch) hole in turn-up for fastener attachment.

G. Adjustable Steel Column Anchor:

1. Two piece anchor consisting of a 6 mm (1/4 inch) diameter steel rod to be welded to steel with offset ends, rod to permit 100 mm (4 inch) vertical adjustment of wire anchor.
2. Triangular shaped wire anchor 100 mm (4 inches) wide formed from 5 (3/16 inch) diameter galvanized wire, to extend at least 75 mm (3 inches) into joints of masonry.

H. Adjustable Steel Beam Anchor:

1. Z or C type steel strap, 30 mm (1 1/4 inches) wide, 3 mm (1/8 inch) thick.
2. Flange hook not less than 38 mm (1 1/2 inches) long.
3. Length to embed in masonry not less than 50 mm (2 inches) in 100 mm (4 inch) nominal thick masonry and 100 mm (4 inches) in thicker masonry.
4. Bend masonry end not less than 40 mm (1 1/2 inches).

I. Ridge Wall Anchors:

1. Form from galvanized steel not less than 25 mm (1 inch) wide by 5 mm (3/16 inch) thick by 600 mm (24 inches) long, plus 50 mm (2 inch) bends.
2. Other lengths as shown.

## **2.4 PREFORMED COMPRESSIBLE JOINT FILLER**

- A. Thickness and depth to fill the joint as specified.
- B. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1, B2F1.
- C. Non-Combustible Type: ASTM C612, Class 5, 1800 degrees F.

## **2.5 ACCESSORIES**

- A. Weep Hole Wicks: Glass fiber ropes, 10 mm (3/8 inch) minimum diameter, 300 mm (12 inches) long.
- B. Box Board:

1. Mineral Fiber Board: ASTM C612, Class 1.
2. 25 mm (1 inch) thickness.
3. Other spacing material having similar characteristics may be used subject to the COTR's approval.

C. Masonry Cleaner:

1. Detergent type cleaner selected for each type masonry used.
2. Acid cleaners are not acceptable.
3. Use soapless type specially prepared for cleaning brick or concrete masonry as appropriate.

D. Fasteners:

1. Concrete Nails: ASTM F1667, Type I, Style 11, 19 mm (3/4 inch) minimum length.
2. Masonry Nails: ASTM F1667, Type I, Style 17, 19 mm (3/4 inch) minimum length.
3. Screws: FS-FF-S-107, Type A, AB, SF thread forming or cutting.

### **PART 3 - EXECUTION**

#### **3.1 JOB CONDITIONS**

A. Protection:

1. Cover tops of walls with nonstaining waterproof covering, when work is not in progress. Secure to prevent wind blow off.
2. On new work protect base of wall from mud, dirt, mortar droppings, and other materials that will stain face, until final landscaping or other site work is completed.

B. Cold Weather Protection:

1. Masonry may be laid in freezing weather when methods of protection are utilized.
2. Comply with MSJC and "Hot and Cold Weather Masonry Construction Manual".

#### **3.2 CONSTRUCTION TOLERANCES**

A. Lay masonry units plumb, level and true to line within the tolerances as per MSJC requirements and as follows:

B. Maximum variation from plumb:

1. In 3000 mm (10 feet) - 6 mm (1/4 inch).
2. In 6000 mm (20 feet) - 10 mm (3/8 inch).
3. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).

C. Maximum variation from level:

1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 inch).
2. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).

- D. Maximum variation from linear building lines:
  - 1. In any bay or up to 6000 mm (20 feet) - 13 mm (1/2 inch).
  - 2. In 12 000 mm (40 feet) or more - 19 mm (3/4 inch).
- E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
  - 1. Minus 6 mm (1/4 inch).
  - 2. Plus 13 mm (1/2 inch).
- F. Maximum variation in prepared opening dimensions:
  - 1. Accurate to minus 0 mm (0 inch).
  - 2. Plus 6 mm (1/4 inch).

### **3.3 INSTALLATION GENERAL**

- A. Keep finish work free from mortar smears or spatters, and leave neat and clean.
- B. Anchor masonry as specified in Paragraph, ANCHORAGE.
- C. Wall Openings:
  - 1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
  - 2. If items are not available when walls are built, prepare openings for subsequent installation.
- D. Tooling Joints:
  - 1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
  - 2. Tool while mortar is soft enough to be compressed into joints and not raked out.
  - 3. Finish joints in exterior face masonry work with a jointing tool, and provide smooth, water-tight concave joint unless specified otherwise.
  - 4. Tool Exposed interior joints in finish work concave unless specified otherwise.
- E. Lintels:
  - 1. All openings with no structural steel lintel or frames, require a lintel formed of concrete masonry lintel or bond beam units filled with grout per ASTM C476 and reinforced with 1- #15m (1-#5) rod top and bottom for each 100 mm (4 inches) of nominal thickness unless shown otherwise.
  - 3. Precast lintels of 4000 psi concrete, of same thickness as partition, and with one Number 5 deformed bar top and bottom for each 100 mm (4 inches) of nominal thickness, may be used in lieu of reinforced CMU masonry lintels.

4. Use steel lintels, for openings over 1600 mm (5 feet 4 inches) wide, brick masonry, and elevator openings unless shown otherwise.
5. Doors having overhead concealed door closers require a steel lintel, and a pocket for closer box.
6. Length for minimum bearing of 100 mm (4 inches) at ends.
7. Build masonry openings or arches over wood or metal centering and supports when steel lintels are not used.

F. Wall, Furring, and Partition Units:

1. Lay out field units to provide for running bond of walls and partitions, with vertical joints in second course centering on first course units unless specified otherwise.
2. Align head joints of alternate vertical courses.
3. At sides of openings, balance head joints in each course on vertical center lines of openings.
4. Use no piece shorter than 100 mm (4 inches) long.
5. On interior partitions provide a 3/4 inch open joint for caulking between existing construction, exterior walls, and abutting masonry partitions.
6. Use not less than 100 mm (4 inches) nominal thick masonry for free standing furring unless shown otherwise.
7. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.

G. Before connecting new masonry with previously laid, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.

H. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.

I. Chases:

1. Do not install chases in masonry walls and partitions exposed to view in finished work, including painted or coated finishes on masonry.
2. Masonry 100 mm (4 inch) nominal thick may have electrical conduits 25 mm (1 inch) or less in diameter when covered with soaps, or other finishes.
3. Full recess chases after installation of conduit, with mortar and finish flush.
4. When pipes or conduits, or both occur in hollow masonry unit partitions retain at least one web of the hollow masonry units.

J. Wetting and Wetting Test:

1. Test and wet brick or clay tile in accordance with BIA 11B.
  2. Do not wet concrete masonry units or glazed structural facing tile before laying.
- K. Temporary Bracing: Provide bracing as required for temporary support of reinforced masonry elements.
- Brace, tie and support as required to maintain position and shape during construction and curing of reinforced masonry.
- L. Do not remove shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.

### **3.4 ANCHORAGE**

A. Veneer to Concrete Walls:

1. Install dovetail slots in concrete vertically at 600 mm (2 feet) on centers.
2. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals.
3. Anchor new masonry facing to existing concrete with corrugated wall ties spaced at 400 mm, (16 inch) maximum vertical intervals, and at 600 mm (2 feet) maximum horizontal intervals. Fasten ties to concrete with power actuated fasteners or concrete nails.

B. Anchorage of Abutting Masonry:

1. Anchor interior 100 mm (4 inch) thick masonry partitions to exterior masonry walls with wall ties. Space ties at 600 mm (2 foot) maximum vertical intervals. Extend ties 100 mm (4 inches) minimum into masonry.
2. Anchor interior masonry bearing walls or interior masonry partitions over 100 mm (4 inches) thick to masonry walls with rigid wall anchors spaced at 400 mm (16 inch) maximum vertical intervals.
3. Anchor abutting masonry walls and partitions to concrete with dovetail anchors. Install dovetail slots vertically in concrete at centerline of abutting wall or partition. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals. Secure anchors to existing wall with two 9 mm (3/8 inch) by 75 mm (3 inch) expansion bolts or two power-driven fasteners.
4. Anchor abutting interior masonry partitions to existing concrete and existing masonry construction, with corrugated wall ties. Extend ties at least 100 mm (4 inches) into joints of new masonry. Fastened to existing concrete and masonry construction, with powder actuated

drive pins, nail or other means that provides rigid anchorage.

Install anchors at 400 mm (16 inch) maximum vertical intervals.

C. Masonry Furring:

1. Anchor masonry furring less than 100 mm (4 inches) nominal thick to masonry walls or to concrete with corrugated wall ties or dovetail anchors.
2. Space not over 600 mm (2 feet) on centers in both directions.

D. Anchorage to Steel Beams or Columns:

1. Use adjustable beam anchors on each flange.
2. At columns weld the 6 mm (1/4 inch) steel rod to steel columns at 300 mm (12 inch) intervals, and place wire ties in masonry courses at 400 mm (16 inches) maximum vertically.

### **3.5 REINFORCEMENT**

A. Joint Reinforcement:

1. Use as joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
2. Reinforcing may be used in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.
3. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
4. Additional joint reinforcement is required in mortar joints at both 200 mm (8 inches) and 400 (16 inches) above and below windows, doors, louvers and similar openings in masonry, except where other type anchors are required for anchorage of masonry to concrete structure.
5. Joint reinforcement is required in every other course of stack bond CMU masonry.
6. Wherever brick masonry is backed up with stacked bond masonry, joint reinforcement is required in every other course of CMU backup, and in corresponding joint of facing brick.

B. Steel Reinforcing Bars:

1. Install in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for lintels and bond beam horizontal reinforcement. Install in wall cavities of reinforced masonry walls where shown.
2. Use grade 60 bars if not specified otherwise.
3. Bond Beams:

- a. Form Bond beams of load-bearing concrete masonry units filled with ASTM C476 grout and reinforced with 2-#15m (#5) reinforcing steel unless shown otherwise. Do not cut reinforcement.
  - b. Brake bond beams only at expansion joints and at control joints, if shown.
4. Grout openings:
- a. Leave cleanout holes in double wythe walls during construction by omitting units at the base of one side of the wall.
  - b. Locate 75 mm x 75 mm (3 in. x 3 in.) min. clean-out holes at location of vertical reinforcement.
  - c. Keep grout space clean of mortar accumulation and sand debris. Clean the grout space every day using a high pressure jet stream of water, or compressed air, or industrial vacuum, or by laying wood strips on the metal ties as the wall is built. If wood strips are used, lift strips with wires as the wall progresses and before placing each succeeding course of wall ties.

### **3.6 CMU CONTROL JOINTS.**

- A. Provide CMU control (CJ) joints where shown on drawings.
- B. Keep joint free of mortar and other debris.
- C. Where joints occur in masonry walls.
  - 1. Install preformed compressible joint filler in brick wythe.
  - 2. Install cross shaped shear keys in concrete masonry unit wythe with preformed compressible joint filler on each side of shear key unless otherwise specified.
  - 3. Install filler, backer rod, and sealant on exposed faces.
- D. Use standard notched concrete masonry units (sash blocks) made in full and half-length units where shear keys are used to create a continuous vertical joint.
- E. Interrupt steel joint reinforcement at expansion and control joints unless otherwise shown.
- F. Fill opening in exposed face of expansion and control joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

### **3.7 BUILDING EXPANSION AND SEISMIC JOINTS**

- A. Keep joint free of mortar. Remove mortar and other debris.
- B. Install non-combustible, compressible type joint filler to fill space completely except where sealant is shown on joints in exposed finish work.

- C. Where joints are on exposed faces, provide depth for backer rod and sealant as specified in Section 07 92 00, JOINT SEALANTS, unless shown otherwise.

### **3.8 ISOLATION SEAL**

- A. Where full height walls or partitions lie parallel or perpendicular to and under structural beams or shelf angles, provide a separation between walls or partitions and bottom of beams or shelf angles not less than the masonry joint thickness unless shown otherwise.
- B. Insert in the separation, a continuous full width strip of non-combustible type compressible joint filler.
- C. Where exposed in finish work, cut back filler material in the joint enough to allow for the joint to be filled with sealant material specified in Section 07 92 00, JOINT SEALANTS.
- D. Laying:
  - 1. Lay concrete masonry units with 10 mm (3/8 inch) joints, with a bond overlap of not less than 1/4 of the unit length, except where stack bond is required.
  - 2. Do not wet concrete masonry units before laying.
  - 3. Bond external corners of partitions by overlapping alternate courses.
  - 4. Lay first course in a full mortar bed.
  - 5. Set anchorage items as work progress.
  - 6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill such voids with mortar or grout.
  - 7. Provide a 3/4 inch open joint for caulking between existing construction, exterior walls, and abutting masonry partitions.
  - 8. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
  - 9. Lay concrete masonry units so that cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar. Unobstructed core openings not less than 50 mm (2 inches) by 75 mm (3 inches).
  - 10. Do not wedge the masonry against the steel reinforcing. Minimum 13 mm (1/2 inch) clear distance between reinforcing and masonry units.
  - 11. Install deformed reinforcing bars of sizes shown.
  - 12. Steel reinforcement, at time of placement, free of loose flaky rust, mud, oil, or other coatings that will destroy or reduce bond.
  - 13. Steel reinforcement in place before grouting.
  - 14. Minimum clear distance between parallel bars: One bar diameter.



15. Hold vertical steel reinforcement in place by centering clips, caging devices, tie wire, or other approved methods, vertically at spacings noted.
16. Support vertical bars near each end and at intermediate intervals not exceeding 192 bar diameters.
17. Reinforcement shall be fully encased by grout or concrete.
18. Splice reinforcement or attach reinforcement to dowels by placing in contact and secured or by placing the reinforcement within 1/5 of the required bar splice length.
19. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
20. Grout cells of concrete masonry units, containing the reinforcing bars, solid as specified under grouting.
21. Cavity and joint horizontal reinforcement may be placed as the masonry work progresses.
22. Rake joints 6 to 10 mm (1/4 to 3/8 inch) deep for pointing with colored mortar when colored mortar is not full depth.

### **3.9 POINTING**

- A. Fill joints with pointing mortar using rubber float trowel to rub mortar solidly into raked joints.
- B. Wipe off excess mortar from joints of glazed masonry units with dry cloth.
- C. Finish exposed joints in finish work with a jointing tool to provide a smooth concave joint unless specified otherwise.

### **3.10 GROUTING**

- A. Preparation:
  1. Clean grout space of mortar droppings before placing grout.
  2. Close cleanouts.
  3. Install vertical solid masonry dams across grout space for full height of wall at intervals of not more than 9000 mm (30 feet). Do not bond dam units into wythes as masonry headers.
  4. Verify reinforcing bars are in cells of units or between wythes as shown.
- B. Placing:
  1. Place grout by hand bucket, concrete hopper, or grout pump.
  2. Consolidate each lift of grout after free water has disappeared but before plasticity is lost.
  3. Do not slush with mortar or use mortar with grout.

4. Interruptions:

- a. When grouting must be stopped for more than an hour, top off grout 40 mm (1-1/2 inch) below top of last masonry course.
- b. Grout from dam to dam on high lift method.
- c. A longitudinal run of masonry may be stopped off only by raking back one-half a masonry unit length in each course and stopping grout 100 mm (4 inches) back of rake on low lift method.

C. Puddling Method:

1. Double wythe masonry constructed grouted in lifts not to exceed 300 mm (12 inches) or less than 50 mm (2 inches) wide.
2. Consolidate by puddling with a grout stick during and immediately after placing.
3. Grout the cores of concrete masonry units containing the reinforcing bars solid as the masonry work progresses.

D. Low Lift Method:

1. Construct masonry to a height of 1.5 m (5 ft) maximum before grouting.
2. Grout in one continuous operation and consolidate grout by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.

E. High Lift Method:

1. Do not pour grout until masonry wall has properly cured a minimum of 4 hours.
2. Place grout in lifts not exceeding 1.5 m (5 ft).
3. Exception:  
Where the following conditions are met, place grout in lifts not exceeding 3.86 m (12.67 ft).
  - a. The masonry has cured for at least 4 hours.
  - b. The grout slump is maintained between 254 and 279 mm (10 and 11 in).
  - c. No intermediate reinforced bond beams are placed between the top and the bottom of the pour height.
4. When vibrating succeeding lifts, extend vibrator 300 to 450 mm (12 to 18 inches) into the preceding lift to close any shrinkage cracks or separation from the masonry units.

### **3.11 PLACING REINFORCEMENT**

- A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use

reinforcement bars with kinks or bends not shown on the Contract Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

- B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 25 mm (1 inch), whichever is greater.
- C. Splice reinforcement bars where shown; do not splice at other places unless accepted by the COTR. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
- D. Provide not less than minimum lap as indicated on shop drawings, or if not indicated, as required by governing code.
- E. Weld splices where indicated. Comply with the requirements of AWS D1.4 for welding materials and procedures.
- F. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations.
- G. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations. Lap joint reinforcement not less than 150 mm (6 inches) at ends. Use prefabricated "L" and "T" sections to provide continuity at corners and intersections. Cut and bend joint reinforcement as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- H. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.
- I. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

### **3.12 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY**

- A. Do not wet concrete masonry units (CMU).
- B. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in

mortar. Maintain head and bed joint widths shown, or if not shown, provide 10 mm (3/8 inch) joints.

C. Where solid CMU units are shown, lay with full mortar head and bed joints.

D. Walls:

1. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

E. Columns, Piers and Pilasters:

1. Use CMU units of the size, shape and number of vertical core spaces shown. If not shown, use units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.
2. Provide pattern bond shown, or if not shown, alternate head joints in vertical alignment.
3. Where bonded pilaster construction is shown, lay wall and pilaster units together to maximum pour height specified.

F. Grouting:

1. Use "Fine Grout" per ASTM C476 for filling spaces less than 100 mm (4 inches) in one or both horizontal directions.
2. Use "Coarse Grout" per ASTM C476 for filling 100 mm (4 inch) spaces or larger in both horizontal directions.

3. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements which follow.

G. Low-Lift Grouting:

1. Provide minimum clear dimension of 50 mm (2 inches) and clear area of 5160 mm<sup>2</sup> (8 square inches) in vertical cores to be grouted.
2. Place vertical reinforcement prior to grouting of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 3 m (10 feet).
3. Lay CMU to maximum pour height. Do not exceed 1.5 m (5 foot) height, or if bond beam occurs below 1.5 m (5 foot) height, stop pour 38 mm (1-1/2 in) below top of bond beam.
4. Pour grout using chute container with spout or pump hose. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 38 mm (1-1/2 inches) below top course of pour.
5. Bond Beams: Stop grout in vertical cells 38 mm (1-1/2 inches) below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

H. High-Lift Grouting:

1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 75 mm (3 inches) and 6450 mm<sup>2</sup> (10 square inches), respectively.
2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout.
3. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.
4. Construct masonry to full height of maximum grout pour specified, prior to placing grout.
5. Limit grout lifts to a maximum height of 1.5 m (5 feet) and grout pour to a maximum height of 7.3 m (24 feet), for single wythe hollow concrete masonry walls, unless otherwise indicated.
6. Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU

over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 3 m (10 feet).

7. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosed before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends.
8. Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing indicated.
9. Place horizontal beam reinforcement as the masonry units are laid.
10. Embed lateral tie reinforcement in mortar joints where indicated. Place as masonry units are laid, at vertical spacing shown.
11. Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide not less than 4.1 mm diameter (8 gage) wire ties spaced 400 mm (16 inches) o.c. for members with 500 mm (20 inches) or less side dimensions, and 200 mm (8 inches) o.c. for members with side dimensions exceeding 500 mm (20 inches).
12. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.
13. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.
14. Place grout by pumping into grout spaces unless alternate methods are acceptable to the COTR.
15. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 1.5 m (5 feet). Allow not less than 30 minutes, nor more than one hour between lifts of a given

- pour. Mechanically consolidate each grout lift during pouring operation.
16. Place grout in lintels or beams over openings in one continuous pour.
  17. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 25 mm (1 inch) of vertically reinforced cavities, during construction of masonry.
  18. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 38 mm (1-1/2 inches) of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

### **3.13 CLEANING AND REPAIR**

#### **A. General:**

1. Clean exposed masonry surfaces on completion.
2. Protect adjoining construction materials and landscaping during cleaning operations.
3. Cut out defective exposed new joints to depth of approximately 19 mm (3/4 inch) and repoint.
4. Remove mortar droppings and other foreign substances from wall surfaces.

#### **B. Concrete Masonry Units:**

1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
2. Allow mud to dry before brushing.

- - - E N D - - -

**SECTION 04 72 00**  
**CAST STONE MASONRY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies manufactured concrete units to simulate a natural stone: cast stone units and synthetic cast stone masonry [adhered manufactured stone masonry veneer (AMSMV)].
- B. Installation of synthetic cast stone units includes units for stone wainscoting, watertables, and window sills, as indicated on the Drawings. Installation of cast stone masonry units includes units for the fireplace surrounds.

**1.2 RELATED WORK**

- A. Setting and pointing mortar: Section 04 05 13, MASONRY MORTARING / Section 04 05 16, MASONRY GROUTING.
- B. Joint sealant and application: Section 07 92 00, JOINT SEALANTS.
- C. Color and texture specified in Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
  - 1. Synthetic cast stone, sample panel, size 100 by 300 by 300 mm (4 by 12 by 12 inches) each color and finish.
  - 2. Show finish on two 100 mm (4-inch) edges and 300 by 300 mm (12 by 12 inch) surface.
- C. Shop Drawings:
  - 1. Synthetic Cast Stone (AMSMV) showing exposed faces, profiles, cross sections, anchorage, reinforcing, jointing and sizes.
  - 2. Setting drawings with setting mark.
- D. Certificates: Test results indicating that the cast stone meets specification requirements and proof of plant certification.
- E. Submit manufacturers test results of cast stone previously made by manufacturer.
- F. Laboratory Data: Description of testing laboratories facilities and qualifications of its principals and key personnel.
- G. List of jobs furnished by the manufacturer, which were similar in scope and at least three (3) years of age.



#### **1.4 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Store synthetic cast stone (AMSMV) and fireplace-surround cast stone under waterproof covers on planking clear of ground.
- B. Protect from handling, dirt, stain, and water damage.
- C. Mark production units with the identification marks as shown on the shop drawings.
- D. Package units and protect them from staining or damage during shipping and storage.
- E. Provide an itemized list of product to support the bill of lading.

#### **1.5 WARRANTY**

Warranty exterior masonry walls against moisture leaks, any defects and subject to terms of "Warranty of Construction", FAR clause 52.246-21.

#### **1.6 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. Cast Stone Institute Technical Manual and Cast Stone Institute standard specifications.
- C. Masonry Veneer Manufacturer's Association(MVMA), current installation guidelines for adhered concrete masonry veneer.
- D. American Society for Testing and Materials (ASTM):
  - A167-99 (2004).....Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
  - A185-07.....Steel, Welded Wire Fabric, Plain for Concrete
  - A615/A615M-08.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  - C33-07.....Concrete Aggregates
  - C150-07.....Portland Cement
  - C503-08.....Marble Dimension Stone (Exterior)
  - C568-08.....Limestone Dimension Stone
  - C615-03.....Granite Dimension Stone
  - C616-08.....Quartz-Based Dimension Stone
  - C979-05.....Pigments for Integrally Colored Concrete
  - C1194-06.....Compressive Strength of Architectural Cast Stone
  - C1195-03.....Absorption of Architectural Cast Stone
  - C1364-07.....Architectural Cast Stone.
  - D2244-07.....Calculation of Color Differences from Instrumentally Measured Color Coordinates.

## **1.7 QUALITY ASSURANCE**

### **A. The Manufacturer:**

1. Must have ten (5) years minimum continuous operating experience and have facilities for manufacturing cast stone as described herein. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of cast stone required in accordance with the project schedule.
2. Must be a member of the Cast Stone Institute.
3. Must have a certified plant (certification by the Cast Stone Institute and the International Code Council).

### **B. Stone setter: Must have ten (5) years experience setting cast or natural building stone.**

### **C. Testing: One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14 m<sup>3</sup>) delivered to the job:**

1. Three (3) field cut cube specimens from each of these sample shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as specified.
2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.
4. Manufacturer shall submit a written list of projects similar and at least three (3) years of age, along with owner, architect and contractor references.

## **1.8 MANUFACTURING TOLERANCES**

- A. Cross section dimensions shall not deviate by more than + 1/8 in. (3 mm) from approved dimension.
- B. Length of units shall not deviate by more than length /360 or + 1/8 in. (3mm), whichever is greater, not to exceed + 1/4 in (6 mm). Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- C. Warp bow or twist of units shall not exceed length/360 or + 1/8 in. (3 mm), whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features - On formed sides of unit, 1/8 in (3 mm), on unformed sides of unit, 3/8 in (9 mm) maximum deviation.

## **1.9 MOCK-UP**

Provide full size unit(s) for use in construction of sample wall. The mock-up becomes the standard of workmanship for the project. The mock-up should include synthetic cast stone and all substrate accessories.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Architectural Cast Stone (fireplace surrounds):
  - 1. Rockcast, A division of Reading Rock, Inc.
  - 2. Continental Cast Stone (Basis-of-Design Product: Designer Collection, Cardiff Square).
  - 3. Custom Cast Stone.
- B. Synthetic Cast Stone [Adhered Manufactured Stone Masonry Veneer (AMSMV)]:
  - 1. Boulder Creek Stone Products.
  - 2. Coronado Products.
  - 3. Eldorado Stone.
  - 4. Owens Corning.
  - 5. Paragon Stone.
  - 6. Dal-Tile (Basis-of-Design Product).

### **2.2 ARCHITECTURAL CAST STONE (FIREPLACE SURROUNDS)**

- A. Comply with ASTM C 1364
- B. Physical properties: Provide the following:
  - 1. Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.
  - 2. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products as 28 days.
  - 3. Air Content - ASTM C173 or C231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for vibrant dry tamp (VDT) products.
  - 4. Linear Shrinkage - ASTM C 426L Shrinkage shall not exceed 0.065%.

### **2.3 SYNTHETIC CAST STONE [ADHERED MANUFACTURED STONE MASONRY VENEER (AMSMV)]**

- A. PSI: 1800-2000.
- B. Absorption: 22%.
- C. Unit Density: 75 pcf.
- D. Max. Density: 15 psf.

### **2.4 RAW MATERIALS FOR ARCHITECTURAL CAST STONE (FIREPLACE SURROUNDS)**

- A. Portland cement - Type I or Type III, white and/or grey, ASTM C 150.

- B. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the vibrant dry tamp (VDT) casting method.
- C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.
- D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
- E. Admixtures- Comply with the following:
  - 1. ASTM C 260 for air-entraining admixtures.
  - 2. ASTM C 494/C 495 M Types A-G for water reducing, retarding, accelerating and high range admixtures.
  - 3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
  - 4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
  - 5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.
- F. Water - Potable
- G. Reinforcing bars:
  - 1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in. (37 mm).
  - 2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.
- H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

## **2.5 RAW MATERIALS FOR SYNTHETIC CAST STONE (AMSMV)**

- A. Portland cement - Type I or Type III, white and/or grey, ASTM C 150.
- B. Coarse aggregates - ASTM C 330.
- C. Sand - ASTM C 144.
- D. Water - Clean and free from deleterious substances.
- E. Mortar materials:
  - a. Cement: ASTM C 150, Type I or masonry cement meeting ASTM C 91.
  - b. Masonry Sand: Complying with ASTM C 144, natural or manufactured.
- F. Metal Lath: ASTM C 847, 2.5 lb., 18 gage galvanized, flat diamond mesh, self-furring stamped sheet.

- G. Drainage Mat: Polymer core, 0.25-inch-thick, drainage and ventilation mat. Basis-of-Design Product: Driwall Rainscreen 020-1, by Keene Building Products, or Contracting Officer's Technical Representative's approved equal.
- H. Water Resistive Barrier: System manufacturer's recommended barrier, and as approved by Contracting Officer's Technical Representative.
- I. Metal Lath Fasteners: Similar to Wind-lock, Lathe-Plate or Lathe-Lock, washers with threaded fasteners, #8 screw, with minimum depth penetration into flange of cold-formed metal framing of 3/8", 6-inches o.c. - or manufacturer's approved - vertical spacing.
- J. Rigid Insulation: 2-inch-thick extruded polystyrene board (R-10).

## **2.6 COLOR AND FINISH**

- A. Match sample on file and provide color and stone shapes as listed in Section 09 06 00.
- B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 in<sup>2</sup> (25mm<sup>2</sup>) and not obvious under direct daylight illumination at a 5 ft. (1.5m) distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3m) distance.
- D. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
  - 1. Total color difference - not greater than 6 units.
  - 2. Total hue difference-not greater than 2 units.

## **2.7 REINFORCING**

- A. Reinforce the units as required by the drawings and for safe handling and structural stress.
  - 1. Minimum reinforcing shall be 0.25 percent of the cross section area.
- B. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1.5in. (38 mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- C. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft (6m) distance.
- D. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.

- E. Remove cement film, if required, from exposed surface prior to packaging for shipment.

## **2.8 CURING**

Cure units in a warm curing chamber 1000 F (537.8 C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 700F (371.1 C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350-degree-days (i.e. 7 days @ 500F (260.0 C) or 5 days @ 700F (371.1 C) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

Installing contractor shall check cast stone materials for fit and finish prior to installation. Do not set unacceptable units.

### **3.2 SETTING TOLERANCES**

- A. Comply with Cast Stone Institute <sup>SM</sup> Technical Manual.
- B. Set stones 1/8 in. (3 mm) or less, within the plane of adjacent units.
- C. Joints, plus - 1/6 in. (1.5 mm), minus - 1/8 in. (3 mm).

### **3.3 JOINTING**

- A. Joint size:
  - 1. At stone joints 3/8 in. (9.5 mm).
  - 2. At stone/stone joints in vertical position 1/4 in. (6 mm) (3/8 in. (9.5 mm) optional).
  - 3. Stone/stone joint exposed on top 3/8 in. (.5 mm).
- B. Joint Materials:
  - 1. Mortar, Type N, ASTM C 270.
  - 2. Use a full bed of mortar at all bed joints.
  - 3. Flush vertical joints full with mortar.
  - 4. Leave all joints with exposed tops or under relieving angles open for sealant.
  - 5. Leave head joints in coping and projecting components open for sealant.
- C. Location of joints:
  - 1. As shown on shop drawings.
  - 2. At control and expansion joints unless otherwise shown.

### **3.4 SETTING**

- A. Drench units with clean water prior to setting.
- B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- C. Set units in full bed of mortar, unless otherwise detailed.
- D. Rake mortar joints 3/4 in. (18 mm) in. for pointing.
- E. Remove excess mortar from unit faces immediately after setting.
- F. Tuck point unit joints to a slight concave profile.

### **3.5 INSTALLING ADHERED MANUFACTURED STONE MASONRY VENEER (AMSMV)**

- A. Follow manufacturer's installation procedure for attaching #15 felt on rigid insulation.
- B. Staple 1/4-inch drainage mat to rigid insulation.
- C. Fasten metal lath thru to cold-formed framing with a minimum stud penetration of 3/8-inch, using threaded fasteners and lath plate steel washers at 8" o.c. vertically to each stud.
- D. Apply manufacturer's recommended depth scratch coat of mortar to lath.
- E. Remove excess mortar from unit faces immediately after setting.
- F. Tuck point unit joints to a slight concave profile.

### **3.6 JOINT PROTECTION**

- A. Comply with requirements of Section 07 92 00, JOINT SEALANTS.
- B. Prime ends of units, insert properly sized backing rod and install required sealant.

### **3.7 REPAIR AND CLEANING**

- A. Repair chips with touchup materials furnished by manufacturer.
- B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
- C. Consult with manufacturer for appropriate cleaners.

### **3.8 INSPECTION AND ACCEPTANCE**

Inspect finished installation according to Bulletin #36 published by the Cast Stone Institute.

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**0SECTION 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 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 COTR.

**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 - LRFD 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 (Ninth Edition, 1989)
  - 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Second Edition, 1995)
  - 3. Code of Standard Practice for Steel Buildings and Bridges (March 2000).
- C. American National Standards Institute (ANSI):

- B18.22.1-98.....Plain Washers
- B18.22M-00.....Metric Plain Washers
- D. American Society for Testing and Materials (ASTM):
- A6/A6M-02.....Standard Specification for General Requirements  
for Rolled Structural Steel Bars, Plates,  
Shapes, and Sheet Piling
- A36/A36M-01.....Standard Specification for Carbon Structural  
Steel
- A53/A53M-01.....Standard Specification for Pipe, Steel, Black  
and Hot-Dipped, Zinc-Coated Welded and Seamless
- A242/A242M-01.....Standard Specification for High-Strength Low-  
Alloy Structural Steel
- A307-00.....Standard Specification for Carbon Steel Bolts  
and Studs, 60,000 psi Tensile Strength
- A325-02.....Standard Specification for Structural Bolts,  
Steel, Heat Treated, 120/105 ksi Minimum Tensile  
Strength
- A500-01.....Standard Specification for Cold Formed Welded  
and Seamless Carbon Steel Structural Tubing in  
Rounds and Shapes
- A501-01.....Standard Specification for Hot-Formed Welded and  
Seamless Carbon Steel Structural Tubing
- A572/A572M-01.....Standard Specification for High-Strength  
Low-Alloy Columbium-Vanadium Structural Steel
- A992/A992M-02.....Standard Specification for Structural Steel  
Shapes
- E. American Welding Society (AWS):
- D1.1-02.....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

## **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.
  - 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. 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 - Allowable Stress Design and Plastic 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 21 00**  
**STEEL JOIST FRAMING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies open web steel joists.

**1.2 RELATED WORK:**

- A. Structural Steel: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- B. Finish Painting: Section 09 91 00, PAINTING.

**1.3 DESIGN REQUIREMENTS:**

Design all elements with the latest published version of applicable Codes.

**1.4 TOLERANCES:**

Deviation from a straight line between ends of any installed joist shall not exceed 10 mm in 3 m (3/8 inch in 10 feet).

**1.5 REGULATORY REQUIREMENTS:**

STEEL JOIST INSTITUTE: Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders, (Latest Edition).

**1.6 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop and Erection Drawings: Complete.
  - 1. Fabrication drawings including details and schedules for the fabrication and assembly of each joist.
  - 2. Erection drawings showing the size and location of each joist, bridging, cross bracing, bearing details, connections, welds, bolts and bearing plates.
- C. Certificates: STEEL JOIST INSTITUTE compliance.

**1.7 QUALITY ASSURANCE:**

Provide documentation that the joist manufacturer is a member of the Steel Joist Institute and has satisfactorily completed work of a similar scope and nature.

**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 (Latest Edition).
  - 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition).

- C. American Society for Testing and Materials (ASTM):  
A307-07.....Carbon Steel Bolts and Studs, 400 MPa (60,000  
psi) Tensile Strength  
A325-09.....Structural Bolts, Steel, Heat Treated, 800/700  
MPa (120/105 ksi) Minimum Tensile Strength  
A490-08.....Heat-Treated Steel Structural Bolts, 1000 MPa  
(150 ksi) Minimum Tensile Strengths
- D. American Welding Society (AWS):  
D1.1-08.....Structural Welding Code - Steel
- E. SSPC: The Society for Protective Coatings:  
Steel Structures Painting Manual, Volumes 1 and 2
- F. Steel Joist Institute (STEEL JOIST INSTITUTE):  
Standard Specifications, Load Tables and Weight Tables for Steel Joists  
and Joist Girders (Latest Edition).
- G. U.S. Army Corps of Engineers:  
CRD-C-621.....Specification for Non-Shrink Grout

## **PART 2 - PRODUCTS**

### **2.1 OPEN WEB STEEL JOISTS:**

K-Series conforming to STEEL JOIST INSTITUTE standard specifications.

### **2.2 ACCESSORIES - FITTINGS:**

- A. Accessories and fittings, including end supports and bridging, in  
accordance with standard STEEL JOIST INSTITUTE specification under which  
joists were designed.
- B. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular hexagon type,  
low carbon steel.
- C. High-strength bolts, including nuts and washers: ASTM A325 or A490 heavy  
hexagon structural bolts.

### **2.3 BEDDING MORTAR:**

- A. For joist ends bearing on concrete or masonry, provide bedding mortar as  
follows:
1. Portland cement and sand, mixed at a ratio of 1 part cement to 3  
parts sand, by volume, with enough water for placement and hydration.
  2. Non-metallic, shrinkage-resistant mortar; premixed, non-corrosive,  
non-staining product containing selected silica sands, portland  
cement, shrinkage compensating agents, plasticizing and water  
reducing agents, complying with CRD-C-621.

## **PART 3 - EXECUTION**

### **3.1 FABRICATION:**

- A. Fabrication and assembly in accordance with applicable standard STEEL  
JOIST INSTITUTE specification:

1. Make chord splices with full penetration welds capable of developing the ultimate strength in tension of the parent material. Make no allowance for the strength of back-up bars or other material incidental to welding.
2. Provide shop-welded connection plates at panel points to receive supplemental framing.
3. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.
4. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable STEEL JOIST INSTITUTE specifications.
5. Ceiling Extensions: Provide ceiling extension in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 12 mm (1/2 inch) of finished wall surface unless otherwise indicated.
6. Bridging: Provide horizontal or diagonal type bridging for joists complying with STEEL JOIST INSTITUTE specifications. Provide bridging anchors for ends of bridging lines terminating at walls or beams. Provide bridging adequate to resist the loads indicated on the Contract Documents.
7. End Anchorage: Provide end anchorages, including bearing plates, to secure joists to adjacent construction, complying with STEEL JOIST INSTITUTE specifications, unless otherwise indicated. Design all end anchorages to resist a minimum net uplift of 1.6 kPa (35 pounds per square foot) of supported area.

### **3.2 SHOP PAINTING:**

- A. Shop painting in accordance with applicable STEEL JOIST INSTITUTE standard specification.
- B. Shop paint joists and accessories with a rust-inhibiting primer paint. For joists which will be finish painted, limit paint to a primer which is compatible with specified finish paint. In high humidity areas, shop paint joists with a zinc-rich primer to receive top coats per the paint system manufacturer's recommendations.

### **3.3 ERECTION:**

- A. Installation of joists in accordance with applicable STEEL JOIST INSTITUTE standard specification.

- B. Handle joists in a manner to avoid damaging of joists. Remove damaged joists from site, except when field repair is approved and such repairs are satisfactorily made in accordance with manufacturer's recommendations.
- C. Accurately set joists and end anchorage in accordance with the applicable STEEL JOIST INSTITUTE standard specification. Secure joists resting on masonry or concrete bearing surfaces by welding or bolting to the steel bearing plates as indicated on the Contract Documents. Secure bridging and anchoring in place prior to application of any construction loads. Distribute any temporary loads so that carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging where joist lengths are 12 m (40 feet) and longer. Where joist lengths are 12 m (40 feet) and longer, install a center row of bolted diagonal bridging to provide lateral stability before slackening of hoisting lines.

**3.4 FIELD PAINTING:**

- A. Clean abraded, corroded, and field welded areas and touch up with same type of paint used in shop painting.
- B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.

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**SECTION 05 31 00**  
**STEEL DECKING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Finish Painting: Section 09 91 00, PAINTING.

**1.3 DESIGN REQUIREMENTS:**

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

**1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and similar information necessary for completing installation as shown and specified, including supplementary framing, sump pans, ridge and valley plates, cant strips, cut openings, special jointing or other accessories. Show welding, side lap, closure, deck reinforcing and closure reinforcing details. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.
- C. Manufacturer's Literature and Data: Showing steel decking section properties and specifying structural characteristics.
- D. Certification: For each type and gauge of metal deck supporting concrete slab or fill, furnish certification of the specified fire ratings. Certify that the units supplied are U.L. listed as a "Steel Floor and Form Unit".
- E. Insurance Certification: Assist the Government in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

### **1.5 QUALITY ASSURANCE:**

- A. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.
- B. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual Global and are listed in "Factory Mutual Research Approval Guide" for "Class 1" fire rated construction.

### **1.6 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):  
A36/A36M-08.....Standard Specification for Carbon Structural Steel
- C. American Institute of Steel Construction (AISC):
  - 1. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design (ninth Edition, 1989)
  - 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition)
- D. American Iron and Steel Institute (AISI):
  - 1. Specification and Commentary for the Design of Cold-Formed Steel Structural Members
- E. American Welding Society (AWS):  
D1.3-08.....Structural Welding Code - Sheet Steel
- F. Factory Mutual (FM Global):
  - 1. Loss Prevention Data Sheet 1-28: Wind Loads to Roof Systems and Roof Deck Securement
  - 2. Factory Mutual Research Approval Guide (2002)

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

- A. Steel Decking: ASTM A653, SS Grade 40.
- B. Galvanizing: ASTM A653, G90.
- C. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- D. Primer for Shop Painted Sheets: Manufacturer's standard primer (2 coats). When finish painting of steel decking is specified in Section 09 91 00, PAINTING primer coating shall be compatible with specified finish painting.

E. Miscellaneous Steel Shapes: ASTM A36.

F. Welding Electrode: E60XX minimum.

G. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise.

Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:

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

## **2.2 REQUIREMENTS:**

- A. Provide steel decking of the type, depth, gauge, and section properties as shown.
- B. Metal Form Deck - Type 1: Single pan fluted units utilized as a permanent form for reinforced concrete slabs. Comply with the depth and gauge requirements as shown on the Contract Documents.
  - 2. Finish: Uncoated.
- D. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces utilized to act as a permanent support for all superimposed loads. Comply with the depth and minimum gage requirements as shown on the Contract Documents.
  - 1. Wide Rib (Type B) deck.
  - 7. Finish: Prime painted. Apply finished coat of paint to underside of deck after installation. Color as selected by Architect.
- F. Do not use steel deck for hanging supports for any type or kind of building components including suspended ceilings, electrical light fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.

## **PART 3 - EXECUTION**

### **3.1 ERECTION:**

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- D. Provide steel decking in sufficient lengths to extend over 3 or more spans, except for interstitial levels.
- E. Place steel decking units at right angles to supporting members. End laps of sheets of roof deck shall be a minimum of 50 mm (2 inches) and shall occur over supports.

F. Fastening Deck Units:

1. Fasten floor deck units to steel supporting members by not less than 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength, spaced not more than 305 mm (12 inches) o.c. with a minimum of two welds per unit at each support. Where two units abut, fasten each unit individually to the supporting steel framework.
2. Tack weld or use self-tapping No. 8 or larger machine screws at 915 mm (3 feet) o.c. for fastening end closures. Only use welds to attach longitudinal end closures.
3. Weld side laps of adjacent floor deck units that span more than 1524 mm (5 feet). Fasten at midspan or 915 mm (3 feet) o.c., whichever is smaller.
4. Fasten roof deck units to steel supporting members by not less than 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength, spaced not more than 305 mm (12 inches) o.c. at every support, and at closer spacing where required for lateral force resistance by diaphragm action. Attach split or partial panels to the structure in every valley. In addition, secure deck to each supporting member in ribs where side laps occur. Power driven fasteners may be used in lieu of welding for roof deck if strength equivalent to the welding specified above is provided. Submit test data and design calculations verifying equivalent design strength.
5. Mechanically fasten side laps of adjacent roof deck units with spans greater than 1524 mm (5 feet) between supports, at intervals not exceeding 915 mm (3 feet) o.c., or midspan, whichever is closer, using self-tapping No. 8 or larger machine screws.
6. Provide any additional fastening necessary to comply with the requirements of Underwriters Laboratories and/or Factory Mutual to achieve the required ratings.
7. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of (45 psf) at eave overhang and (30 psf) for other roof areas.
8. Weld end laps of corrugated form deck units in valley of side lap and at middle of sheet (maximum spacing of welds is 380 mm (15 inches)).
9. Weld corrugated deck to intermediate supports in an X pattern. Weld in valley of side laps on every other support and in the valley of the center corrugation on the remaining supports (maximum spacing of welds is 760 mm (30 inches)).

G. Cutting and Fitting:

1. Cut all metal deck units to proper length in the shop prior to shipping.

2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the Structural Drawings.
3. Other penetrations shown on the approved metal deck shop drawings but not shown on the Structural Drawings are to be located, cut and reinforced by the trade requiring the opening.
4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.
5. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the Resident Engineer. Provide any additional reinforcing or framing required for the opening at no cost to the Government. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected metal deck.
6. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

### **3.2 WELDING:**

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

### **3.3 FIELD REPAIR:**

1. Areas scarred during erection.
2. Welds to be thoroughly cleaned and touched-up. Touch-up paint for shop painted units of same type used for shop painting.

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**SECTION 05 40 00**  
**COLD-FORMED METAL FRAMING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 RELATED WORK:**

- A. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- B. 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. 1/600 of the wall height at stone masonry.

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.
- D. For cold-formed metal framing indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for its preparation.

#### **1.5 APPLICABLE PUBLICATIONS:**

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



Specification and Commentary for the Design of Cold-Formed Steel  
Structural Members (1996)

C. American Society of Testing and Materials (ASTM):

A36/A36M(REV. A)-2003...Standard Specifications for Carbon Structural  
Steel

A123/A123M-2002.....Standard Specifications for Zinc (Hot-Dip  
Galvanized) Coatings on Iron and Steel Products

A153/A153M-2003.....Standard Specifications for Zinc Coating (Hot-  
Dip) on Iron and Steel Hardware

A307-2002.....Standard Specifications for Carbon Steel Bolts  
and Studs

A653/A653M-2003.....Standard Specifications for Steel Sheet, Zinc-  
Coated (Galvanized) or Zinc-Iron Alloy-Coated  
(Galvannealed) by the Hot-Dip Process

C955-2003.....Standard Specifications for Load-Bearing  
(Transverse and Axial) Steel Studs, Runners  
(Tracks), and Bracing or Bridging for Screw  
Application of Gypsum Panel Products and Metal  
Plaster Bases

C1107-2002.....Standard Specifications for Packaged Dry,  
Hydraulic-Cement Grout (Non-shrink)

E488-96(Reapproved 2003)Standard Test Methods for Strength of Anchors  
in Concrete and Masonry Elements

E1190-95(Reapproved 2000)Standard Test Methods for Strength of Power-  
Actuated Fasteners Installed in Structural  
Members

D. American Welding Society (AWS):

D1.3-(98).....Structural Welding Code-Sheet Steel

E. Military Specifications (Mil. Spec.):

MIL-P-21035B(Reinst. Notice 2)      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. Sheet Steel for joists, studs and accessories 18 gage and lighter: ASTM A653, structural steel, zinc coated G90, with a yield of 230 MPa (33 ksi) minimum.
- C. Galvanizing Repair Paint: MIL-P-21035B.
- D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

### **2.2 WALL FRAMING:**

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, at 16" o.c., of web depth indicated, with lipped flanges, and complying with the following:
  - 1. Design Uncoated-Steel Thickness: As needed.
  - 2. Flange Width: As needed.
  - 3. Web: Unpunched at roof overbuilds; punched at perimeter of building.
- 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 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.

#### **2.4 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 05 50 00**  
**METAL FABRICATIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.
- B. Items specified.
  - 1. Support for Wall Mounted Items
  - 2. Guards
  - 3. Loose Lintels
  - 4. Ladders

**1.2 RELATED WORK**

- A. Railings attached to steel stairs: Section 05 51 00, METAL STAIRS.
- B. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Prime and finish 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. Shop Drawings:
  - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
  - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
  - 3. Provide templates and rough-in measurements as required.
- C. Manufacturer's Certificates:
  - 1. Live load designs as specified.
- D. Design Calculations for specified live loads including dead loads.
- E. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

**1.4 QUALITY ASSURANCE**

- A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each product type shall be the same and be made by the same manufacturer.

- C. Assembled product to the greatest extent possible before delivery to the site.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

#### **1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
  - B18.6.1-81(R1997).....Wood Screws
  - B18.2.2-87(R2005).....Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
  - A36/A36M-05.....Structural Steel
  - A47-99(R2004).....Malleable Iron Castings
  - A48-03.....Gray Iron Castings
  - A53-06.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated  
Welded and Seamless
  - A123-02.....Zinc (Hot-Dip Galvanized) Coatings on Iron and  
Steel Products
  - A167-99(R2004).....Stainless and Heat-Resisting Chromium-Nickel  
Steel Plate, Sheet and Strip
  - A269-07.....Seamless and Welded Austenitic Stainless Steel  
Tubing for General Service
  - A307-07.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile  
Strength
  - A312/A312M-06.....Seamless, Welded, and Heavily Cold Worked  
Austenitic Stainless Steel Pipes
  - A391/A391M-01.....Grade 80 Alloy Steel Chain
  - A653/A653M-07.....Steel Sheet, Zinc Coated (Galvanized) or Zinc-  
Iron Alloy Coated (Galvannealed) by the Hot-Dip  
Process
  - A786/A786M-05.....Rolled Steel Floor Plate
  - 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
  - B632-02.....Aluminum-Alloy Rolled Tread Plate
  - C1107-07.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

- D3656-04.....Insect Screening and Louver Cloth Woven from  
Vinyl-Coated Glass Yarns
- F436-07.....Hardened Steel Washers
- F468-06.....Nonferrous Bolts, Hex Cap Screws, and Studs for  
General Use
- F593-02.....Stainless Steel Bolts, Hex Cap Screws, and Studs
- F1667-05.....Driven Fasteners: Nails, Spikes and Staples
- D. American Welding Society (AWS):
  - D1.1-04.....Structural Welding Code Steel
  - D1.2-03.....Structural Welding Code Aluminum
  - D1.3-98.....Structural Welding Code Sheet Steel
- E. National Association of Architectural Metal Manufacturers (NAAMM)
  - AMP521-01.....Pipe Railing Manual
  - AMP 500-505-1988.....Metal Finishes Manual
  - MBG 531-00.....Metal Bar Grating Manual
  - MBG 532-00.....Heavy Duty Metal Bar Grating Manual
- F. Structural Steel Painting Council (SSPC):
  - SP 1-05.....No. 1, Solvent Cleaning
  - SP 2-05.....No. 2, Hand Tool Cleaning
  - SP 3-05.....No. 3, Power Tool Cleaning
- G. Federal Specifications (Fed. Spec):
  - RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

## **PART 2 - PRODUCTS**

### **2.1 DESIGN CRITERIA**

- A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.
- B. Ladders and Rungs: 120 kg (250 pounds) at any point.

### **2.2 MATERIALS**

- A. Structural Steel: ASTM A36.
- B. Steel Pipe: ASTM A53.
  - 1. Galvanized for exterior locations.
  - 2. Type S, Grade A unless specified otherwise.
  - 3. NPS (inside diameter) as shown.
- C. Primer Paint: As specified in Section 09 91 00, PAINTING.
- D. Modular Channel Units:
  - 1. Factory fabricated, channel shaped, cold formed sheet steel shapes, complete with fittings bolts and nuts required for assembly.
  - 2. Form channel with in turned pyramid shaped clamping ridges on each side.



3. Provide case hardened steel nuts with serrated grooves in the top edges designed to be inserted in the channel at any point and be given a quarter turn so as to engage the channel clamping ridges. Provide each nut with a spring designed to hold the nut in place.
4. Factory finish channels and parts with oven baked primer when exposed to view. Channels fabricated of ASTM A525, G90 galvanized steel may have primer omitted in concealed locations. Finish screws and nuts with zinc coating.
5. Fabricate snap-in closure plates to fit and close exposed channel openings of not more than 0.3 mm (0.0125 inch) thick stainless steel.

### **2.3 HARDWARE**

#### **A. Rough Hardware:**

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

#### **B. Fasteners:**

1. Bolts with Nuts:
  - a. ASME B18.2.2.
  - b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
  - c. ASTM F468 for nonferrous bolts.
  - d. ASTM F593 for stainless steel.
2. Screws: ASME B18.6.1.
3. Washers: ASTM F436, type to suit material and anchorage.
4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

### **2.4 FABRICATION GENERAL**

#### **A. Material**

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

#### **B. Size:**

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

#### C. Connections

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

#### D. Fasteners and Anchors

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

#### E. Workmanship

1. General:
  - a. Fabricate items to design shown.
  - b. Furnish members in longest lengths commercially available within the limits shown and specified.
  - c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.

- d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
  - e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
  - f. Prepare members for the installation and fitting of hardware.
  - g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
  - h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
- a. Weld in accordance with AWS.
  - b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
  - c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
  - d. Finish welded joints to match finish of adjacent surface.
3. Joining:
- a. Miter or butt members at corners.
  - b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
- a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
  - b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
- a. Accurately cut, machine and fit joints, corners, copes, and miters.
  - b. Fit removable members to be easily removed.
  - c. Design and construct field connections in the most practical place for appearance and ease of installation.
  - d. Fit pieces together as required.
  - e. Fabricate connections for ease of assembly and disassembly without use of special tools.

- f. Joints firm when assembled.
- g. Conceal joining, fitting and welding on exposed work as far as practical.
- h. Do not show rivets and screws prominently on the exposed face.
- i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:

- 1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
- 2. Steel and Iron: NAAMM AMP 504.
  - a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
  - b. Surfaces exposed in the finished work:
    - 1) Finish smooth rough surfaces and remove projections.
    - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
  - c. Shop Prime Painting:
    - 1) Surfaces of Ferrous metal:
      - a) Items not specified to have other coatings.
      - b) Galvanized surfaces specified to have prime paint.
      - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
      - d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
      - e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
    - 2) Non ferrous metals: Comply with MAAMM-500 series.

G. Protection:

- 1. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

## **2.5 SUPPORTS**

A. General:

- 1. Fabricate ASTM A36 structural steel shapes as shown.
- 2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
- 3. Field connections may be welded or bolted.

B. For Wall Mounted Items:

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

## **2.6 FRAMES**

- A. Elevator Entrance Wall Opening.
  1. Fabricate of channel shapes, plates, and angles as shown.
  2. Weld or bolt head to jamb as shown.
  3. Weld clip angles to bottom of frame and top of jamb members extended to structure above for framed construction.
    - a. Provide holes for anchors.
    - b. Weld head to jamb members.

## **2.7 GUARDS**

- A. Guard Angles for Overhead Door:
  1. Cut away top portion of outstanding leg of angle and extend remaining portion of angle up wall.
  2. Weld filler piece across head of opening to jamb angles.
  3. Make provisions for fasteners and anchorage.

## **2.8 LOOSE LINTELS**

- A. Furnish lintels of sizes shown. Where size of lintels is not shown, provide the sizes specified.
- B. Fabricate lintels with not less than 150 mm (6 inch) bearing at each end for nonbearing masonry walls, and 200 mm (8 inch) bearing at each end for bearing walls.
- C. Provide one angle lintel for each 100 mm (4 inches) of masonry thickness as follows except as otherwise specified or shown.
  1. Openings 750 mm to 1800 mm (2-1/2 feet to 6 feet) - 100 x 90 x 8 mm (4 x 3-1/2 x 5/16 inch).
  2. Openings 1800 mm to 3000 mm (6 feet to 10 feet) - 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).
- D. For 150 mm (6 inch) thick masonry openings 750 mm to 3000 mm (2-1/2 feet to 10 feet) use one angle 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).
- E. Provide bearing plates for lintels where shown.

- F. Weld or bolt upstanding legs of double angle lintels together with 19 mm (3/4 inch bolts) spaced at 300 mm (12 inches) on centers.
- G. Insert spreaders at bolt points to separate the angles for insertion of metal windows, louver, and other anchorage.
- H. Where shown or specified, punch upstanding legs of single lintels to suit size and spacing of anchor bolts.
- I. Elevator Entrance:
  - 1. Fabricate lintel from plate bent to channel shape, and provide a minimum of 100 mm (4 inch) bearing each end.
  - 2. Cut away the front leg of the channel at each end to allow for concealment behind elevator hoistway entrance frame.

## **2.9 LADDERS**

- A. Steel Ladders:
  - 1. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.
  - 2. Fabricate angle brackets of 50 mm (2 inch) wide by 13 mm (1/2 inch) thick steel; brackets spaced maximum of 1200 mm (4 feet) apart and of length to hold ladder 175 mm (7 inches) from wall to center of rungs. Provide turned ends or clips for anchoring.
  - 3. Provide holes for anchoring with expansion bolts through turned ends and brackets.
  - 4. Where shown, fabricate side rails curved, twisted and formed into a gooseneck.
- B. Ladder Rungs:
  - 1. Fabricate from 25 mm (one inch) diameter steel bars.
  - 2. Fabricate so that rungs will extend at least 100 mm (4 inches) into wall with ends turned 50 mm (2 inches), project out from wall 175 mm (7 inches), be 400 mm (16 inches) wide and be designed so that foot cannot slide off end.
  - 3. Galvanized after fabrication, ASTM A123, G-90 rungs for exterior use and for access to pits.

## **2.10 RAILINGS**

- A. In addition to the dead load design railing assembly to support live load specified.
- B. Fabrication General:
  - 1. Provide continuous welded joints, dressed smooth and flush.
  - 2. Standard flush fittings, designed to be welded, may be used.
  - 3. Exposed threads will not be approved.
  - 4. Form handrail brackets to size and design shown.

5. Exterior Post Anchors.

- a. Fabricate tube or pipe sleeves with closed ends or plates as shown.
- b. Where inserts interfere with reinforcing bars, provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.
- c. Provide heavy pattern sliding flange base plate with set screws at base of pipe or tube posts. Base plates are not required on pipe sleeves where ornamental railings occur.

6. Interior Post Anchors:

- a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.
- b. Weld or thread flanged fitting to posts at base.
- c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.
- d. Provide sliding flange base plate on posts secured with set screws.
- e. Weld flange base plate to removable posts set in sleeves.

C. Handrails:

1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.
2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.

D. Steel Pipe Railings:

1. Fabricate of steel pipe with welded joints.
2. Number and space of rails as shown.
3. Space posts for railings not over 1800 mm (6 feet) on centers between end posts.
4. Form handrail brackets from malleable iron.
5. Fabricate removable sections with posts at end of section.

6. Removable Rails:

- a. Provide "U" shape brackets at each end to hold removable rail as shown. Use for top and bottom horizontal rail when rails are joined together with vertical members.
- b. Secure rail to brackets with 9 mm (3/8 inch) stainless steel through bolts and nuts at top rail only when rails joined with vertical members.
- c. Continuously weld brackets to post.
- d. Provide slotted bolt holes in rail bracket.

- e. Weld bolt heads flush with top of rail.
- f. Weld flanged fitting to post where posts are installed in sleeves.
- 7. Opening Guard Rails:
  - a. Fabricate rails with flanged fitting at each end to fit between wall opening jambs.
  - b. Design flange fittings for fastening with machine screws to steel plate anchored to jambs.
  - c. Fabricate rails for floor openings for anchorage in sleeves.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Items set into concrete or masonry.
  - 1. Provide temporary bracing for such items until concrete or masonry is set.
  - 2. Place in accordance with setting drawings and instructions.
  - 3. Build strap anchors, into masonry as work progresses.
- C. Set frames of corner guards flush with finish floor or wall surface and, where applicable, flush with side of opening.
- D. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.
- E. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.

### **3.2 INSTALLATION OF SUPPORTS**

- A. Anchorage to structure.
  - 1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
  - 2. Secure supports to concrete inserts by bolting or continuous welding as shown.
  - 3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
  - 4. Secure steel plate or hat channels to studs as detailed.
- B. Supports for Wall Mounted items:
  - 1. Locate center of support at anchorage point of supported item.



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

### **3.3 GUARDS**

#### **A. Steel Angle Corner Guards:**

1. Build into masonry as the work progress.
2. Set into formwork before concrete is placed.
3. Set angles flush with edge of opening and finish floor or wall or as shown.
4. At existing construction fasten angle and filler piece to adjoining construction with 16 mm (5/8 inch) diameter by 75 mm (3 inch) long expansion bolts 450 mm (18 inches) on center.
5. Install Guard Angles at Edges of Stairwell, Openings in Slab, and Overhead Doors where shown.

### **3.4 STEEL LINTELS**

- A. Use lintel sizes and combinations shown or specified.
- B. Install lintels with longest leg upstanding, except for openings in 150 mm (6 inch) masonry walls install lintels with longest leg horizontal.
- C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

### **3.5 LADDERS**

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

### **3.6 CLEAN AND ADJUSTING**

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

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**SECTION 05 51 00**  
**METAL STAIRS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Section specifies steel stairs with railings.
- B. Types:
  - 1. Closed riser stairs with concrete filled treads and platforms.
  - 2. Industrial stairs: with open riser stairs.

**1.2 RELATED WORK**

- A. Concrete fill for treads and platforms: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Requirements for shop 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. Shop Drawings: Show design, fabrication details, installation, connections, material, and size of members.

**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 basic designation.
- B. American Society for Testing and Materials (ASTM):
  - A36/A36M-05.....Structural Steel
  - A47-99 (R2004).....Ferritic Malleable Iron Castings
  - A48-03.....Gray Iron Castings
  - A53-06.....Pipe, Steel, Black and Hot-Dipped Zinc-Coated  
Welded and Seamless
  - A307-07.....Carbon Steel Bolts and Studs, 60000 psi Tensile  
Strength
  - A653/653M-07.....Steel Sheet, Zinc Coated (Galvanized) or Zinc  
Alloy Coated (Galvannealed) by the Hot-Dip  
Process
  - A563-07.....Carbon and Alloy Steel Nuts
  - A1008-07.....Steel, Sheet, Cold-Rolled, Carbon, Structural,  
High-Strength, Low-Alloy
  - A786/A786M-00.....Rolled Steel Floor Plates
  - A1011-04.....Steel, Sheet and Strip, Strip, Hot-Rolled  
Carbon, Structural, High-Strength, Low-Alloy
- C. American Welding Society (AWS):

- D1.1-04.....Structural Welding Code-Steel
- D1.3-98.....Structural Welding Code-Sheet Steel
- D. The National Association of Architectural Metal Manufacturers (NAAMM)  
Manuals:
  - Metal Bar Gratings (ANSI/NAAMM MBG 531-00)
  - AMP521-01.....Pipe Railing Manual, Including Round Tube
- E. American Iron and Steel Institute (AISI):
  - 2001.....Design of Cold-Formed Steel Structural Members

## **PART 2 - PRODUCTS**

### **2.1 DESIGN CRITERIA**

- A. Design stairs to support a live load of 500 kg/m<sup>2</sup> (100 pounds per square foot).
- B. Structural design, fabrication and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.
- C. Design Grating treads in accordance with NAAMM Metal Bar Grating Manual.
- D. Design pipe railings in accordance with NAAMM Pipe Railing Manual for 900 N (200 pounds) in any direction at any point.

### **2.2 MATERIALS**

- A. Steel Pipe: ASTM A53, Standard Weight, zinc coated.
- B. Steel Grating: Metal bar type grating NAAMM BG.
- C. Sheet Steel: ASTM A1008.
- D. Structural Steel: ASTM A36.
- E. Steel Floor Plate: ASTM 786.
- F. Steel Decking: Form from zinc coated steel conforming to ASTM A446, with properties conforming to AISI Specification for the Design of Cold-Formed Steel Structural Members.
- G. Steel Plate: ASTM A1011.
- H. Malleable Iron Castings: ASTM A47.
- I. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- J. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).

### **2.3 FABRICATION GENERAL**

- A. Fasteners:
  - 1. Conceal bolts and screws wherever possible.
  - 2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.
- B. Welding:
  - 1. Structural steel, AWS D1.1 and sheet steel, AWS D1.3.

2. Where possible, locate welds on unexposed side.
  3. Grind exposed welds smooth and true to contour of welded member.
  4. Remove welding splatter.
- C. Remove sharp edges and burrs.
- D. Fit stringers to head channel and close ends with steel plates welded in place where shown.
- E. Fit face stringer to newel post by tenoning into newel post, or by notching and fitting face stringer to side of newel where shown.
- F. Shop Prime Painting: Prepare surface and apply primer as specified for ferrous metals in Section 09 91 00, PAINTING.

#### **2.4 RAILINGS**

- A. Fabricate railings, including handrails, from steel pipe with flush.
1. Connections may be standard fittings designed for welding, or coped or mitered pipe with full welds.
  2. Wall handrails are provided under Section 05 50 00, METAL FABRICATIONS.
- B. Return ends of handrail to wall and close free end.
- C. Provide standard terminal castings where fastened to newel.
- D. Space intermediate posts not over six feet on center between end post.
- E. Fabricate handrail brackets from cast malleable iron.
- F. Provide standard terminal fittings at ends of post and rails.

#### **2.5 CLOSED RISER STAIRS**

- A. Provide treads, risers, platforms, railings, stringers, headers and other supporting members.
- B. Fabricate pans for treads and platforms, and risers from sheet steel  
Fabricate pans for platforms from steel decking where shown.
- C. Form risers with sanitary cove.
- D. Fabricate stringers, headers, and other supporting members from structural steel.

#### **2.6 INDUSTRIAL STAIRS**

- A. Provide treads, platforms, railings, stringers and other supporting members as shown.
- B. Treads and platforms of galvanized steel grating:
1. Fabricate steel grating treads and platforms in accordance with requirements of NAAMM Metal Bar Grating Manuals.
  2. Provide end banding bars, except where carrier angle are used at tread ends.
  3. Support treads by use of carrier plates or carrier angle. Use carrier plate end banding bars on exterior stairs.

4. Provide abrasive nosing on treads and edge of platforms at head of stairs.
5. Provide toe plates on platforms where shown.
6. Metal Bar-Grating Stairs: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."
  - a. Fabricate treads and platforms from steel grating with 32-by-5-mm (1-1/4-by-3/16-inch) bearing bars at 24 mm (15/16 inch) o.c and crossbars at 100 mm (4 inches) o.c.
  - b. Fabricate grating treads with cast abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
- C. Guardrails and Handrails of galvanized steel pipe.
- D. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

### **PART 3 - EXECUTION**

#### **3.1 STAIR INSTALLATION**

- A. Provide hangers and struts required to support the loads imposed.
- B. Perform job site welding and bolting as specified for shop fabrication.
- C. Set stairs and other members in position and secure to structure as shown.
- D. Install stairs plumb, level and true to line.
- E. Provide steel closure plate to fill any gap between the stringer and surrounding shaft wall. Weld and finish with prime and paint finish of adjoining steel.

#### **3.2 RAILING INSTALLATION**

- A. Install standard terminal fittings at ends of posts and rails.
- B. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts, except secure posts at concrete by setting in sleeves filled with commercial non-shrink grout.
- C. Set rails horizontal or parallel to rake of stairs to within 3 mm in 3650 mm (1/8-inch in 12 feet).
- D. Set posts plumb and aligned to within 3 mm in 3650 mm (1/8-inch in 12 feet).

#### **3.3 FIELD PRIME PAINTING**

- A. When installation is complete, clean field welds and surrounding areas to bright metal, and coat with same primer paint used for shop priming.
- B. Touch-up abraded areas with same primer paint used for shop priming.

C. Touch up abraded galvanized areas with zinc rich paint as specified in section 09 91 00, PAINTING.

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**SECTION 06 10 00  
ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

Section specifies wood blocking, framing, sheathing, furring, nailers, rough hardware, and light wood construction.

**1.2 RELATED WORK:**

- A. Milled woodwork: Section 06 20 00, FINISH CARPENTRY.
- B. Gypsum sheathing: Section 09 29 00, GYPSUM BOARD.

**1.3 SUBMITTALS:**

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

**1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:**

- A. Protect lumber and other products from dampness both during and after delivery at site.
- B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.
- C. Stack plywood and other board products so as to prevent warping.
- D. Locate stacks on well drained areas, supported at least 150 mm (6 inches) above grade and cover with well ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

**1.5 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- B. American Forest and Paper Association (AFPA):  
National Design Specification for Wood Construction  
NDS-05.....Conventional Wood Frame Construction
- C. American Institute of Timber Construction (AITC):  
A190.1-02.....Structural Glued Laminated Timber
- D. American Society of Mechanical Engineers (ASME):  
B18.2.1A-96(R2005).....Square and Hex Bolts and Screws  
B18.2.2-87(R2005).....Square and Hex Nuts  
B18.6.1-81 (R97).....Wood Screws  
B18.6.4-98(R2005).....Thread Forming and Thread Cutting Tapping Screws  
and Metallic Drive Screws



- E. American Plywood Association (APA):  
E30-03.....Engineered Wood Construction Guide
- F. American Society for Testing And Materials (ASTM):  
A47-99(R2004).....Ferritic Malleable Iron Castings  
A48-03.....Gray Iron Castings  
A653/A653M-07.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process  
C954-04.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 inch (2.24 mm) to 0.112-inch (2.84 mm) in thickness  
C1002-04.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs  
D143-94(R2004).....Small Clear Specimens of Timber, Method of Testing  
D1760-01.....Pressure Treatment of Timber Products  
D2559-04.....Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions  
D3498-03.....Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems  
F844-07.....Washers, Steel, Plan (Flat) Unhardened for General Use  
F1667-05.....Nails, Spikes, and Staples
- G. Federal Specifications (Fed. Spec.):  
MM-L-736C.....Lumber; Hardwood
- H. Commercial Item Description (CID):  
A-A-55615.....Shield, Expansion (Wood Screw and Lag Bolt Self Threading Anchors)
- I. Military Specification (Mil. Spec.):  
MIL-L-19140E.....Lumber and Plywood, Fire-Retardant Treated
- J. Truss Plate Institute (TPI):  
TPI-85.....Metal Plate Connected Wood Trusses
- K. U.S. Department of Commerce Product Standard (PS)  
PS 1-95.....Construction and Industrial Plywood  
PS 20-05.....American Softwood Lumber Standard

## **PART 2 - PRODUCTS**

### **2.1 LUMBER:**

- A. Unless otherwise specified, each piece of lumber bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.
  - 1. Identifying marks in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
  - 2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.
- B. Lumber Other Than Structural:
  - 1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
  - 2. Framing lumber: Minimum extreme fiber stress in bending of 1100.
  - 3. Furring, blocking, nailers and similar items 100 mm (4 inches) and narrower Standard Grade; and, members 150 mm (6 inches) and wider, Number 2 Grade.
- C. Sizes:
  - 1. Conforming to Prod. Std., PS20.
  - 2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.
- D. Moisture Content:
  - 1. At time of delivery and maintained at the site.
  - 2. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
  - 3. Lumber over 50 mm (2 inches) thick: 25 percent or less.
- E. Fire Retardant Treatment:
  - 1. Mil Spec. MIL-L-19140 with piece of treated material bearing identification of testing agency and showing performance rating.
  - 2. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.
- F. Preservative Treatment:
  - 1. Do not treat Heart Redwood and Western Red Cedar.
  - 2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 600 mm (24 inches) from ground; nailers, edge strips, blocking,

crickets, curbs, cant, vent strips and other members used in connection with roofing and flashing materials.

3. Treat other members specified as preservative treated (PT).
4. Preservative treat by the pressure method complying with ASTM D1760, except any process involving the use of Chromated Copper arsenate (CCA) for pressure treating wood is not permitted.

## **2.2 PLYWOOD**

- A. Comply with Prod. Std., PS 1.
- B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type.
- C. Sheathing:
  1. APA rated Exposure 1 or Exterior; panel grade CD or better.
  2. Wall sheathing:
    - a. Minimum 9 mm (11/32 inch) thick with supports 400 mm (16 inches) on center and 12 mm (15/32 inch) thick with supports 600 mm (24 inches) on center unless specified otherwise.
    - b. Minimum 1200 mm (48 inches) wide at corners without corner bracing of framing.
  3. Roof sheathing:
    - a. Minimum 9 mm (11/32 inch) thick with span rating 24/0 or 12 mm (15/32 inch) thick with span rating for supports 400 mm (16 inches) on center unless specified otherwise.
    - b. Minimum 15 mm (19/32 inch) thick or span rating of 40/20 or 18 mm (23/32 inch) thick or span rating of 48/24 for supports 600 mm (24 inches) on center.

## **2.3 ROUGH HARDWARE AND ADHESIVES:**

- A. Anchor Bolts:
  1. ASME B18.2.1 and ANSI B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.
  2. Extend at least 200 mm (8 inches) into masonry or concrete with ends bent 50 mm (2 inches).
- B. Miscellaneous Bolts: Expansion Bolts: C1D, A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Use 13 mm (1/2 inch) bolt unless shown otherwise.
- C. Washers
  1. ASTM F844.
  2. Use zinc or cadmium coated steel or cast iron for washers exposed to weather.

D. Screws:

1. Wood to Wood: ANSI B18.6.1 or ASTM C1002.
2. Wood to Steel: ASTM C954, or ASTM C1002.

E. Nails:

1. Size and type best suited for purpose unless noted otherwise. Use aluminum-alloy nails, plated nails, or zinc-coated nails, for nailing wood work exposed to weather and on roof blocking.
2. ASTM F1667:
  - a. Common: Type I, Style 10.
  - b. Concrete: Type I, Style 11.
  - c. Barbed: Type I, Style 26.
  - d. Underlayment: Type I, Style 25.
  - e. Masonry: Type I, Style 27.
  - f. Use special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 32 mm (1-1/4 inches) long, 8d and deformed or annular ring shank.

**PART 3 - EXECUTION**

**3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:**

A. Conform to applicable requirements of the following:

1. AFPA National Design Specification for Wood Construction for timber connectors.
2. AITC Timber Construction Manual for heavy timber construction.
3. AFPA WCD-number 1, Manual for House Framing for nailing and framing unless specified otherwise.
4. APA for installation of plywood or structural use panels.
5. ASTM F 499 for wood underlayment.
6. TPI for metal plate connected wood trusses.

B. Fasteners:

1. Nails.
  - a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA Manual for House Framing where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.
  - b. Use special nails with framing connectors.
  - c. For sheathing, select length of nails sufficient to extend 25 mm (1 inch) into supports.

- d. Use eight penny or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
  - e. Use 16 penny or larger nails for nailing through 50 mm (2 inch) thick lumber.
  - f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.
  - g. Nailing Schedule; Using Common Nails:
2. Bolts:
- a. Fit bolt heads and nuts bearing on wood with washers.
  - b. Countersink bolt heads flush with the surface of nailers.
  - c. Embed in concrete and solid masonry or use expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
  - d. Use toggle bolts to hollow masonry or sheet metal.
  - e. Use bolts to steel over 2.84 mm (0.112 inch, 11 gage) in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 600 mm (24 inch) intervals between end bolts. Use clips to beam flanges.
3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.
- a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
  - b. ASTM C 954 for steel over 0.84 mm (0.033 inch) thick.
4. Power actuated drive pins may be used where practical to anchor to solid masonry, concrete, or steel.
5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Use metal plugs, inserts or similar fastening.
6. Screws to Join Wood:
- a. Where shown or option to nails.
  - b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
  - c. Spaced same as nails.
- C. Set sills or plates level in full bed of mortar on masonry or concrete walls.
- 1. Space anchor bolts 1200 mm (4 feet) on centers between ends and within 150 mm (6 inches) of end. Stagger bolts from side to side on plates over 175 mm (7 inches) in width.
  - 2. Use shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
  - 3. Closely fit, and set to required lines.
- D. Blocking Nailers, and Furring:

1. Install furring, blocking, nailers, and grounds where shown.
  2. Use longest lengths practicable.
  3. Use fire retardant treated wood blocking where shown at openings and where shown or specified.
  4. Layers of Blocking or Plates:
    - a. Stagger end joints between upper and lower pieces.
    - b. Nail at ends and not over 600 mm (24 inches) between ends.
    - c. Stagger nails from side to side of wood member over 125 mm (5 inches) in width.
  5. Unless otherwise shown, use wall furring 25 mm by 75 mm (1 inch by 3 inch) continuous wood strips installed plumb on walls, using wood shims where necessary so face of furring forms a true, even plane. Space furring not over 400 mm (16 inches on centers, butt joints over bearings and rigidly secure in place. Anchor furring on 400 mm (16 inches) centers.
- E. Rough Bucks:
1. Install rough wood bucks at opening in masonry or concrete where wood frames or trim occur.
  2. Brace and maintain bucks plumb and true until masonry has been built around them or concrete cast in place.
  3. Cut rough bucks from 50 mm (2 inch) thick stock, of same width as partitions in which they occur and of width shown in exterior walls.
  4. Extend bucks full height of openings and across head of openings; fasten securely with anchors specified.
- F. Sheathing:
1. Use plywood for sheathing.
  2. Lay panels with joints staggered, with edge and ends 3 mm (1/8 inch) apart and nailed over bearings as specified.
  3. Set nails not less than 9 mm (3/8 inch) from edges.
  4. Install 50 mm by 100 mm (2 inch by 4 inch) blocking spiked between joists, rafters and studs to support edge or end joints of panels.
  5. Match and align sheathing which is an extension of work in place to existing.

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**SECTION 06 20 00**  
**FINISH CARPENTRY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies interior millwork.
- B. Items specified.
  - Kitchen Millwork
  - Interdisciplinary Office Millwork
  - Laundry Room Millwork
  - Medical Supply Room Built-In Counter and Overhead Cabinets
  - Counter or Work Tops
  - Wall Paneling
  - Media Wall in Living Room
  - Dining Room Millwork
  - Handrail
  - House Care Office Millwork
  - Base
  - Medicine and Biomed Room Millwork
  - Wall Moldings at Beds
  - Trim at Mantle around Fireplace
  - Wood Beams
  - Bookcases
  - Memory Shelf
  - Swing Gate at Kitchen & Servery
  - Wood Storage Shelving with Standards and Brackets

**1.2 RELATED WORK**

- A. Fabricated Metal brackets, countertop legs: Section 05 50 00, METAL FABRICATIONS.
- B. Framing, furring and blocking: Section 06 10 00, ROUGH CARPENTRY.
- C. Wood doors: Section 08 14 00, WOOD DOORS.
- D. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Other Countertops: Division 12, FURNISHINGS.
- G. High impact wallcoverings and corner guards: Section 10 26 00, WALL AND DOOR PROTECTION.
- H. Electrical light fixtures and duplex outlets: Division 26, ELECTRICAL.

### **1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
  - 1. Millwork items - Half full size scale for sections and details 1:50 (1/4-inch) for elevations and plans.
  - 2. Show construction and installation.
- C. Samples:

Plastic laminate finished plywood or particleboard, 150 mm by 300 mm (six by twelve inches).
- D. Certificates:
  - 1. Indicating fire retardant treatment of materials meet the requirements specified.
  - 2. Indicating moisture content of materials meet the requirements specified.
- E. List of acceptable sealers for fire retardant and preservative treated materials.
- F. Manufacturer's literature and data:
  - 1. Finish hardware
  - 2. Sinks with fittings
  - 3. Electrical components

### **1.4 DELIVERY, STORAGE AND HANDLING**

- A. Protect lumber and millwork from dampness, maintaining moisture content specified both during and after delivery at site.
- B. Store finishing lumber and millwork in weathertight well ventilated structures or in space in existing buildings designated by COTR. Store at a minimum temperature of 21<sup>0</sup>C (70<sup>0</sup>F) for not less than 10 days before installation.
- C. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

### **1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Testing and Materials (ASTM):
  - A36/A36M-08.....Structural Steel
  - A53-07.....Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless



- A167-99 (R2009).....Stainless and Heat-Resisting Chromium-Nickel  
Steel Plate, Sheet, and Strip
- B26/B26M-09.....Aluminum-Alloy Sand Castings
- B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods,  
Wire, Profiles, and Tubes
- E84-09.....Surface Burning Characteristics of Building  
Materials
- C. American Hardboard Association (AHA):  
A135.4-04.....Basic Hardboard
- D. Builders Hardware Manufacturers Association (BHMA):  
A156.9-03.....Cabinet Hardware  
A156.11-04.....Cabinet Locks  
A156.16-02.....Auxiliary Hardware
- E. Hardwood Plywood and Veneer Association (HPVA):  
HP1-09.....Hardwood and Decorative Plywood
- F. National Particleboard Association (NPA):  
A208.1-99.....Wood Particleboard
- G. American Wood-Preservers' Association (AWPA):  
AWPA C1-03.....All Timber Products - Preservative Treatment by  
Pressure Processes
- H. Architectural Woodwork Institute (AWI):  
AWI-99.....Architectural Woodwork Quality Standards and  
Quality Certification Program
- I. National Electrical Manufacturers Association (NEMA):  
LD 3-05.....High-Pressure Decorative Laminates
- J. U.S. Department of Commerce, Product Standard (PS):  
PS20-05.....American Softwood Lumber Standard
- K. Military Specification (Mil. Spec):  
MIL-L-19140E.....Lumber and Plywood, Fire-Retardant Treated
- L. Federal Specifications (Fed. Spec.):  
A-A-1922A.....Shield Expansion  
A-A-1936.....Contact Adhesive  
FF-N-836D.....Nut, Square, Hexagon Cap, Slotted, Castle  
FF-S-111D(1).....Screw, Wood  
MM-L-736(C).....Lumber, Hardwood

## **PART 2 - PRODUCTS**

### **2.1 LUMBER**

- A. Grading and Marking:

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

B. Sizes:

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

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

D. Hardboard: AHA A135.4.

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

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

F. Use edge grain Wood members exposed to weather.

## **2.2 PLYWOOD**

A. Softwood Plywood:

1. Prod. Std.
2. Grading and Marking:
  - a. Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood.
  - b. The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PS1.
3. Plywood, 13 mm (1/2 inch) and thicker; not less than five ply construction, except 32 mm (1-1/4 inch) thick plywood not less than seven ply.
4. Plastic Laminate Plywood Cores:
  - a. Exterior Type, and species group.
  - b. Veneer Grade: A-C.
5. Shelving Plywood:

- a. Interior Type, any species group.
  - b. Veneer Grade: A-B or B-C.
- 6. Other: As specified for item.
- B. Hardwood Plywood:
  - 1. HPVA: HP.1
  - 2. Species of face veneer shall be as shown or as specified in connection with each particular item.
  - 3. Inside of Building:
    - a. Use Type II (interior) A grade veneer for transparent finish.
  - 4. Use plain sliced maple unless specified otherwise.

## **2.3 PARTICLEBOARD**

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

## **2.4 PLASTIC LAMINATE**

- A. NEMA LD-3.
- B. Exposed decorative surfaces including countertops, both sides of cabinet doors, and for items having plastic laminate finish. General Purpose, Type HGL.
- C. Cabinet Interiors including Shelving: Both of following options to comply with NEMA, CLS as a minimum.
  - 1. Plastic laminate clad plywood or particle board.
  - 2. Resin impregnated decorative paper thermally fused to particle board.
- D. Backing sheet on bottom of plastic laminate covered wood tops: Backer, Type HGP.
- E. Post Forming Fabrication, Decorative Surfaces: Post forming, Type HGP.

## **2.5 ADHESIVE**

- A. For Plastic Laminate: Fed. Spec. A-A-1936.
- B. For Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.
- C. For Exterior Millwork: Unextended melamine resin, phenol resin, or resorcinol resin.

## **2.6 WOOD STORAGE SHELVING**

- A. Exposed Shelving: Made from the following material, 19 mm (3/4 inch) thick.

1. Softwood Boards: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; Grade II; kiln dried.
- B. Standards for Adjustable Shelf Brackets: BMHA A156.9, B04102; zinc-plated steel.
- C. Adjustable Shelf Brackets: BMHA A156.9, B04112; zinc-plated steel.

## **2.7 HARDWARE**

### **A. Rough Hardware:**

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electric-galvanizing process. Galvanized where specified.
2. Use galvanized coating on ferrous metal for exterior work unless non-ferrous metals or stainless is used.
3. Fasteners:
  - a. Bolts with Nuts: FF-N-836.
  - b. Expansion Bolts: A-A-1922A.
  - c. Screws: Fed. Spec. FF-S-111.

### **B. Finish Hardware**

1. Cabinet Hardware: ANSI A156.9.
  - a. Door/Drawer Pulls: B02011. Door in seismic zones: B03182.
  - b. Drawer Slides: B05051 for drawers over 150 mm (6 inches) deep, B05052 for drawers 75 mm to 150 mm 3 to 6 inches) deep, and B05053 for drawers less than 75 mm (3 inches) deep.
  - c. Adjustable Shelf Standards: B4061 with shelf rest B04083.
  - d. Concealed Hinges: B1601, minimum 110 degree opening.
  - e. Butt Hinges: B01361, for flush doors, B01381 for inset lipped doors, and B01521 for overlay doors.
  - f. Cabinet Door Catch: B0371 or B03172.
  - g. Vertical Slotted Shelf Standard: B04103 with shelf brackets B04113, sized for shelf depth.
2. Cabinet Locks: ANSI A156.11.
  - a. Drawers and Hinged Door: E07262.
  - b. Sliding Door: E07162.
3. Auxiliary Hardware: ANSI A156.16.
  - a. Shelf Bracket: B04041, japanned or enameled finish.
  - b. Combination Garment rod and Shelf Support: B04051 japanned or enamel finish.
  - c. Closet Bar: L03131 chrome finish of required length.
  - d. Handrail Brackets: L03081 or L03101.

- 1) Cast Aluminum, satin polished finish.
- 2) Cast Malleable Iron, japanned or enamel finish.
4. Steel Channel Frame and Leg supports for Counter top. Fabricated under Section 05 50 00, METAL FABRICATIONS.
5. Edge Strips Moldings:
  - a. Driven type "T" shape with serrated retaining stem; vinyl plastic to match plastic laminate color, stainless steel, or 3 mm (1/8 inch) thick extruded aluminum.
6. Primers: Manufacturer's standard primer for steel providing baked enamel finish.

## **2.8 MOISTURE CONTENT**

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

## **2.9 FIRE RETARDANT TREATMENT**

- A. Where wood members and plywood are specified to be fire retardant treated, the treatment shall be in accordance with Mil. Spec. MIL-L19140.
- B. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings.
- C. Each piece of treated material shall bear identification of the testing agency and shall indicate performance in accordance with such rating of flame spread and smoke developed.
- D. Treat wood for maximum flame spread of 25 and smoke developed of 25.
- E. Fire Resistant Softwood Plywood:
  1. Use Grade A, Exterior, plywood for treatment.
  2. Meet the following requirements when tested in accordance with ASTM E84.
    - a. Flame spread: 0 to 25.
    - b. Smoke developed: 100 maximum
- F. Fire Resistant Hardwood Plywood:
  1. Core: Fire retardant treated softwood plywood.
  2. Hardwood face and back veneers untreated,
  3. Factory seal panel edges, to prevent loss of fire retardant salts.

## 2.10 FABRICATION

### A. General:

1. Except as otherwise specified, use AWI Custom Grade for architectural woodwork and interior millwork.
2. Finish woodwork shall be free from pitch pockets.
3. Except where special profiles are shown, trim shall be standard stock molding and members of the same species.
4. Plywood shall be not less than 13 mm (1/2 inch), unless otherwise shown or specified.
5. Edges of members in contact with concrete or masonry shall have a square corner caulking rebate.
6. Fabricate members less than 4 m (14 feet) in length from one piece of lumber, back channeled and molded as shown.
7. Interior trim and items of millwork to be painted may be fabricated from jointed, built-up, or laminated members, unless otherwise shown on drawings or specified.
8. Plastic Laminate Work:
  - a. Factory glued to either a plywood or a particle board core, thickness as shown or specified.
  - b. Cover exposed edges with plastic laminate, except where aluminum, stainless steel, or plastic molded edge strips are shown or specified. Use plastic molded edge strips on 19 mm (3/4-inch) molded thick or thinner core material.
  - c. Provide plastic backing sheet on underside of countertops, vanity tops, thru-wall counter and sills including back splashes and end splashes of countertops.
  - d. Use backing sheet on concealed large panel surface when decorative face does not occur.

### B. Wall Paneling:

1. Fire Retardant Treated
2. Hardwood plywood
  - a. Flush ungrooved, with 1/4 inch reveals.
  - b. Thickness: 19 mm (3/4 inch) unless shown otherwise.
  - c. Prefinished, type of finish is specified in-Section 09 06 00, SCHEDULE FOR FINISHES. Slip-matched wall panels.

### C. Counter or Work Tops:

1. Fabrication with plastic laminate over 32 mm (1-1/4 inch) thick core unless shown otherwise.

- a. Use decorative laminate for exposed edges of tops 38 mm (1-1/2 inches) wide and on back splash and end splash. Use plastic or metal edges for top edges less than 38 mm (1-1/2 inches) wide.
  - b. Assemble back splash and end splash to counter top.
  - c. Use one piece counters for straight runs.
  - d. Miter corners for field joints with overlapping blocking on underside of joint.
2. Fabricate wood counter for work benches as shown.
- D. Wood handrails at Wall Moldings, Fireplace Mantle, Wood Beams, Bookcases, Memory Shelf, and Wall Base:
1. Fabricate from Maple or Birch.
  2. AWI Premium Grade.
  3. Fabricate in one piece and one length when practical.
  4. Fabricate curved sections for ends of rails to return to wall and where rails change slope or direction.
  5. Joints are permitted only where rail changes direction or slope, or where necessary for field erection or shipping.
  6. Scarf or dowel all joints to provide a smooth and rigid connection. Glue all joints.
  7. Fit joints, to produce a hair-line crack.
  8. Completely shop fabricated in accordance with approved shop drawings.

### **PART 3 - EXECUTION**

#### **3.1 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain work areas and storage areas to a minimum temperature of 21<sup>0</sup>C (70<sup>0</sup>F) for not less than 10 days before and during installation of interior millwork.
- B. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

#### **3.2 INSTALLATION**

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

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

B. Wood Storage Shelving Installation:

1. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 900 mm (36 inches) o.c. and within 150 mm (6 inches) of end of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
2. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.

C. Wall Paneling:

1. Hardwood plywood:
  - a. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane. For flush paneling with reveal joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do use face fastening.

D. Handrails:

1. Install in one piece and one length when practical.
2. Where rails change slope or direction, install special curved sections and ends of rails to return to wall, glue all field joints.
3. Install brackets within 300 mm (12 inches) of ends of handrails and at every spaced intervals between not exceeding 1500 mm (5 feet) on centers at intervals between as shown. Anchor brackets as detailed and rails to brackets with screws.

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

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## **SECTION 07 08 00**

### **FACILITY EXTERIOR CLOSURE COMMISSIONING**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION**

- A. The requirements of this Section apply to all sections of Division 07 and Division 08.
- B. This project will have selected building systems commissioned. The complete list of equipment and systems to be commissioned is specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. The commissioning process, which the Contractor is responsible to execute, is defined in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. A Commissioning Agent (CxA) appointed by the VA will manage the commissioning process.

##### **1.2 RELATED WORK**

- A. Section 01 00 00 GENERAL REQUIREMENTS.
- B. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.
- C. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

##### **1.3 SUMMARY**

- A. This Section includes requirements for commissioning the Facility exterior closure, related subsystems and related equipment. This Section supplements the general requirements specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.
- B. The commissioning activities have been developed to support the VA requirements to meet guidelines for Federal Leadership in Environmental, Energy, and Economic Performance.
- C. The commissioning activities have been developed to support the United States Green Building Council (USGBC) LEED™ rating program and to support delivery of project performance in accordance with the Contract Documents developed with the approval of the VA.
  - 1. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" prerequisite of "Fundamental Building Systems Commissioning".
  - 2. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" requirements for the "Enhanced Building System Commissioning" credit.

3. Activities and documentation for the LEED™ section on "Measurement and Verification" requirements for the Measurement and Verification credit.

D. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for more details regarding processes and procedures as well as roles and responsibilities for all Commissioning Team members.

#### **1.4 DEFINITIONS**

Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for definitions.

#### **1.5 COMMISSIONED SYSTEMS**

A. Commissioning of a system or systems specified in Division 07 and Division 08 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 Facility exterior closure systems will be commissioned:

1. Roofs (EPDM, flashing & sheet metal, metal roofing, roof specialties, and roof accessories)
2. Exterior Insulation and Finish Systems (EIFS)
3. Curtain Wall Systems (Mullions, glazing, and sealing)
4. Exterior Doors (emergency exit, and service)
5. Exterior Windows (Aluminum and glazing)
6. Louvers and Vents
7. Sealants (Caulking, mechanical seals, and wind and vapor barriers)

#### **1.6 SUBMITTALS**

A. The commissioning process requires review of selected Submittals. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the VA prior to forwarding to the Contractor. Refer to Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, and SAMPLES for further details.

B. The commissioning process requires Submittal review simultaneously with engineering review. Specific submittal requirements related to the commissioning process are specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

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

## **PART 3 - EXECUTION**

### **3.1 PRE-FUNCTIONAL CHECKLISTS**

The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed checklists shall be submitted to the VA and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission. Refer to SECTION 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for submittal requirements for Pre-Functional Checklists, Equipment Startup Reports, and other commissioning documents.

### **3.2 CONTRACTORS TESTS**

Contractor tests as required by other sections of Division 07 or Division 08 shall be scheduled and documented in accordance with Section 01 00 00 GENERAL REQUIREMENTS. The Commissioning Agent will witness selected Contractor tests. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

### **3.3 SYSTEMS FUNCTIONAL PERFORMANCE TESTING:**

The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the COTR. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials,

and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed. See Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS, for additional details.

#### **3.4 TRAINING OF VA PERSONNEL**

Training of the VA operation and maintenance personnel is required in cooperation with the COTR and Commissioning Agent. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the VA COTR after submission and approval of formal training plans. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS and Division 21 Sections for additional Contractor training requirements.

----- END -----

**SECTION 07 13 52**  
**MODIFIED BITUMINOUS SHEET WATERPROOFING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 MANUFACTURER'S QUALIFICATIONS:**

A. Approval by Contracting Officer is required of products and services of proposed manufacturers, and installers, and will be based upon submission by Contractor that:

1. Manufacturer regularly and presently manufactures bituminous sheet waterproofing as one of its principal products.
2. Installer has technical qualifications, experience, trained personnel and facilities to install specified items.
3. Manufacturer's product submitted has been in satisfactory and efficient operation on three similar installations for at least three years.
4. Submit list of installations, include name and location of project and name of owner.

**1.3 SUBMITTALS:**

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Bituminous sheet.
2. Primer.
3. Mastic.
4. Protection material, temporary and permanent.
5. Printed installation instructions for conditions specified.

C. Certificates:

1. Indicating bituminous sheet manufacturer's approval of primer, and roof cement.
2. Indicating bituminous sheet waterproofing manufacturer's qualifications as specified.
3. Approval of installer by bituminous sheet manufacturers.
4. Water test report.

**1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:**

A. Deliver materials to job in manufacturer's original unopened container.

- B. Do not store material in areas where temperature is lower than 10 degrees C (50 degrees F,) or where prolonged temperature is above 32 degrees C (90 degrees F).

#### **1.5 ENVIRONMENTAL REQUIREMENTS:**

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

#### **1.6 WARRANTY:**

Warrant bituminous sheet waterproofing installation against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period is five (5) years.

#### **1.7 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by basic designation only.
- B. Federal Specifications (Fed. Spec.):  
UU-B-790A.....Building Paper, Vegetable Fiber: (Kraft, Water-INT AMD 1 Proof, Water Repellent and Fire Resistant)
- C. American Society for Testing and Materials (ASTM):  
C578-07.....Rigid Cellular Polystyrene Thermal Insulation  
D41-05.....Asphalt Primer Used in Roofing, Dampproofing and Waterproofing  
D2822-05.....Asphalt Roof Cement  
D6380-03.....Asphalt Roll Roofing (Organic Felt)
- D. American Hardboard Association (AHA):  
A135.4-1995.....Basic Hardboard

### **PART 2 - PRODUCTS**

#### **2.1 BITUMINOUS SHEET:**

- A. Cold applied waterproofing membrane composed primarily of modified bituminous material prefabricated in sheet form designed for below grade exterior and split slab waterproofing. Sheet reinforced with fibers at manufacturer's option. Waterproofing below slabs will require a concrete blinding.
- B. Thickness of Bituminous Sheet: 1.5 mm (60 mils), plus or minus 0.13 mm (5 mils), and bonded to a 0.1 mm (4 mil) thick plastic sheet.
- C. Provide with a release sheet to prevent bonding of bituminous sheet to itself.

D. Basis of Design: Basis of Design for Sheet Waterproofing shall be Bituthene 3000/3000 HC by Grace Construction Products.

## **2.2 PRIMER AND ROOF CEMENT:**

- A. Furnished by manufacturer of bituminous sheet as required for particular application in accordance with sheet manufacturer's instructions.
- B. Primer: ASTM D41.
- C. Roof Cement: ASTM D4586.

## **2.3 PROTECTION MATERIAL:**

- A. Polystyrene: ASTM C578, Type I or VIII, 13 mm (1/2-inch) minimum thickness.
- B. Hardboard: PS-58, Service Type, 6 mm (1/4-inch) thick.
- C. Waterproofed Building Paper: Fed. Spec. UU-B-790.
- D. Roll Roofing: ASTM D6380, Class S (smooth), Type III with minimum net mass per unit area of roofing, 2495 g/m<sup>2</sup> (51 lb/100 ft<sup>2</sup>).

## **2.4 PATCHING COMPOUND:**

A factory prepared, non-shrinking, fast setting, cementitious adhesive compound containing no ferrous metal or oxide.

# **PART 3 - EXECUTION**

## **3.1 PREPARATION:**

- A. Surface Condition:
  - 1. Before applying waterproofing materials, ensure concrete and masonry surfaces are fully cured, smooth, clean, dry, and free from high spots, depressions, loose and foreign particles and other deterrents to adhesion.
  - 2. Fill voids, joints, and cracks with patching compound.
- B. Concrete surfaces cured a minimum of seven days, free from release agents, concrete curing agents, and other contaminants.

## **3.2 APPLICATION:**

- A. Priming:
  - 1. Prime concrete and masonry surfaces.
  - 2. Application method, amount of primer and condition or primer before installation of bituminous sheet as recommended by primer manufacturer.
  - 3. Reprime when required in accordance with manufacturer's instructions.
- B. Bituminous Sheet Installation:
  - 1. Remove release sheet prior to application.

2. Lay bituminous sheet from low point to high point so that laps shed water.
3. Treat expansion, construction and control joints and evident working cracks as expansion joints. Apply bituminous sheet in double thickness over joint by first applying a strip of bituminous sheet not less than 200 mm (8 inches) wide, centered over joint.
4. Lap seams not less than 50 mm (2 inches).
5. Lay succeeding sheet with laps, and roll or press into place.
6. Repair misaligned or inadequately lapped seams in accordance with manufacturer's instructions.
7. Seal seams and terminations in accordance with sheet manufacturer's instructions.

C. Corner Treatment:

1. At inside and outside corners apply double cover using an initial strip not less than 280 mm (11 inches) wide, centered along axis of corner.
2. Cover each strip completely by the regular application of bituminous sheet.
3. Provide a fillet or cant on inside corners.
4. Form cants using patching compound
5. Do not use wood, fiber, and insulating materials for cants.

D. Projection Treatment:

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

### 3.3 PROTECTION:

- A. Protect bituminous sheet before backfill or wearing courses are placed.
- B. Install protection material and hold in place in accordance with instructions of manufacturer of waterproofing materials.
- C. Permanent Protection:
  1. Vertical Surfaces:
    - a. Install hardboard, polystyrene, or roll roofing protection material.
    - b. Extend protection full height from footing to top of backfill.
    - c. If graded backfill is used, use roll roofing or hardboard.
- D. Horizontal Surfaces:
  1. Install roll roofing protection under concrete wearing courses.



2. Install roll roofing, hardboard, or polystyrene under earth backfill.
3. Where no concrete wearing course occurs or when surfaces will bear heavy traffic and will not immediately be covered with a wearing course, use protection specified for vertical surfaces.

**E. Temporary Protection:**

When waterproofing materials are subjected to damage by sunlight and can not be immediately protected as specified, protect waterproofing materials by waterproof building paper or suitable coating approved by manufacturer of waterproofing system used.

**3.4 PATCHING:**

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

**3.5 TESTING:**

- A. Before any protection or wearing course is applied, test all horizontal applications of waterproofing with a minimum of 25 mm (1-inch) head of water above highest point and leave for 24 hours.
- B. Mark leaks and repair when waterproofing is dry.
- C. Certify, to Resident Engineer, that water tests have been made and that areas tested were found watertight.

**3.6 INSPECTION:**

Do not cover waterproofed surfaces by other materials or backfill until work is approved by Resident Engineer.

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**SECTION 07 18 13**  
**PEDESTRIAN TRAFFIC COATINGS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies a surface applied elastomeric and composition waterproofing type membrane suitable for light pedestrian traffic and recreation areas, but not intended for heavy industrial use.

**1.2 RELATED WORK**

- A. Metal flashing: Section 07 60 00, FLASHING AND SHEET METAL.
- B. Color and texture of finish coat: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 TEST AREA**

Before start of general application, apply the elastomeric coating as specified in a representative test area. The area shall be approximately 1.44 m<sup>2</sup> (16 square feet). The area to be covered by the coating shall include all site conditions such as flashings bases, corners and projections through the coating. Location of test area shall be determined by the COTR, and after approval, shall serve as an example for the remaining work.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers Literature and Data: Each material, indicating compliance with specification requirements.
- C. Samples: Each finish color on 100 by 200 mm (4 by 8 inch) substrate, layered to show each coat and finish.

**1.5 WARRANTY**

Warranty surfaces, where elastomeric coating has been applied, against leaks and other failures, over and above normal wear and failure of substrate, and subject to the terms of the "Warranty of Construction", FAR clause 52.246-21.

In addition, contractor shall warrant the coating system against defective materials and workmanship for a period of two years following date of completion. Warrant that installed waterproof coating system shall be free of defects including adhesive failure, cohesive failure, weathering deficiencies and waterproofing failure resulting from substrate cracking up to 1/16 inch.

## 1.6 DELIVERY AND STORAGE

- A. Deliver materials to the site in original sealed containers, clearly marked with manufacturer's name and brand, and type of material.
- B. Store materials in weathertight and dry storage facility. Protect from damage from handling, weather and construction operations before, during and after installation. Store materials at temperatures and under conditions recommended by the manufacturer.

## 1.7 ENVIRONMENTAL REQUIREMENTS

Do not proceed with application of materials when ambient temperature is less or greater than that recommended by the coating material manufacturer.

## 1.8 SAFETY REQUIREMENTS

Keep products away from heat, sparks and flame. Do not permit use of spark-producing equipment during application of flammable products or where explosive fumes are present.

## 1.9 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - C794-06.....Adhesion-in-Peel of Elastomeric Joint Sealants
  - D412-06.....Vulcanized Rubber and Thermoplastic Elastomers-Tension
  - D2240-05.....Rubber Property - Durometer Hardness
  - E96-05.....Water Vapor Transmission of Materials
  - G23.....Accelerated Weathering
  - D756.....Accelerated Aging
  - C67.....Freeze-Thaw
  - MIL-D-1044.....Water Resistance
  - MIL-D-3134.....Water Absorption

## PART 2 - PRODUCTS

### 2.1 PRIMER

Type required by the elastomeric coating manufacturer.

### 2.2 ELASTOMERIC BASE AND TOP COAT

- A. Elastomeric base and top coat materials shall meet or exceed the following requirements:

Property	Test Method	Base Coat	Top Coat
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Property	Test Method	Base Coat	Top Coat
Tensile Strength	ASTM D412	300 pounds per square inch	600 pounds per square inch
Elongation	ASTM D412	550 percent	200 percent
Hardness, Shore A	ASTM D2240	20	45
Peel Strength (on concrete)	ASTM C794	30 pounds, 100 percent cohesion	100 percent cohesion to base coat
Permeability	ASTM E96	12 metric perms	0.06 metric perms

B. Aggregate: Uniformly graded, washed **silica sand** of particle sizes, shape, and minimum hardness recommended in writing by traffic coating manufacturer.

1. Spreading Rate: As recommended by manufacturer for substrate and service conditions indicated.

### **PART 3 - EXECUTION**

#### **3.1 SURFACE PREPARATION**

- A. Surfaces to be coated shall be clean and dry. Smooth rough spots and tool marks.
- B. Fill holes, depressions and cracks with fillers compatible with the coating material and recommended by the coating manufacturer.
- C. Subsurface imperfections that telegraph through the finish coating surface will not be accepted.

#### **3.2 WORK COORDINATION**

To provide a watertight installation, coordinate this work with flashing and drains required to be installed before the coating work begins and be completed after the coating is in place.

#### **3.3 APPLICATION**

- A. Prime all surfaces to receive elastomeric waterproofing materials as recommended by the products manufacturer.
- B. Where horizontal surfaces intersect vertical surfaces provide a sealant type fillet as recommended by the manufacturers.
- C. Apply manufacturer's approved slip-sheet over cleaned and primed concrete substrate.
- D. Apply elastomeric base coat at a rate that will ensure a dry film thickness of not less than 35 mils.

E. Apply elastomeric top coat at a rate which will ensure a dry film thickness of 15 mils for the top coat and a total combined dry film thickness for the base and top coats of not less than 50 mils.

F. Complete the base to a uniform established line as shown.

#### **3.4 CLEANING**

Remove smears of elastomeric material from other work.

#### **3.5 PROTECTION**

Protect the finished coating from traffic until the coating cures.

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**SECTION 07 21 13**  
**THERMAL INSULATION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 RELATED WORK**

- A. Insulation in connection with roofing and waterproofing: Section 07 22 00, ROOF AND DECK INSULATION.
- B. Safing insulation: Section 07 84 00, FIRESTOPPING.

**1.3 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES .
- B. Manufacturer's Literature and Data:
  - 1. Insulation, each type used
  - 2. Adhesive, each type used.
  - 3. Tape
- C. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

**1.4 STORAGE AND HANDLING:**

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

**1.5 APPLICABLE PUBLICATIONS:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - C270-08.....Mortar for Unit Masonry
  - C516-08.....Vermiculite Loose Fill Thermal Insulation
  - C549-06.....Perlite Loose Fill Insulation
  - C552-07.....Cellular Glass Thermal Insulation.
  - C553-08.....Mineral Fiber Blanket Thermal Insulation for  
Commercial and Industrial Applications
  - C578-08.....Rigid, Cellular Polystyrene Thermal Insulation

C591-08.....Unfaced Preformed Rigid Cellular  
Polyisocynurate Thermal Insulation

C612-04.....Mineral Fiber Block and Board Thermal  
Insulation

C665-06.....Mineral Fiber Blanket Thermal Insulation for  
Light Frame Construction and Manufactured  
Housing

C728-05.....Perlite Thermal Insulation Board

C954-07.....Steel Drill Screws for the Application of  
Gypsum Panel Products or Metal Plaster Base to  
Steel Studs From 0.033 (0.84 mm) inch to 0.112  
inch (2.84 mm) in thickness

C1002-07.....Steel Self-Piercing Tapping Screws for the  
Application of Gypsum Panel Products or Metal  
Plaster Bases to Wood Studs or Steel Studs

D312-00(R2006).....Asphalt Used in Roofing

E84-08.....Surface Burning Characteristics of Building  
Materials

F1667-05.....Driven Fasteners: Nails, Spikes and Staples.

## **PART 2 - PRODUCTS**

### **2.1 INSULATION - GENERAL:**

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

Material Type	Percent by Weight
Polyisocyanurate/polyurethane	
Glass fiber reinforced	6 percent recovered material
Rock wool material	75 percent recovered material

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

## **2.2 PERIMETER INSULATION IN CONTACT WITH SOIL:**

Polystyrene Board: ASTM C578, Type IV, V, VI, VII, or IX where covered by soil or concrete.

## **2.3 EXTERIOR FRAMING OR FURRING INSULATION:**

- A. Batt or Blanket: Optional.
- B. Mineral Fiber: ASTM C665, Type II, Class C, Kraft-faced, Category I where framing is faced with gypsum board.
- C. Mineral Fiber: ASTM C665, Type III, Class A where framing is not faced with gypsum board.

## **2.4 ACOUSTICAL INSULATION:**

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

## **2.5 RIGID INSULATION:**

On the exterior face of perimeter foundation walls

## **2.6 FASTENERS:**

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

## **2.7 ADHESIVE:**

- A. As recommended by the manufacturer of the insulation.
- B. Asphalt: ASTM D312, Type III or IV.
- C. Mortar: ASTM C270, Type 0.

## **2.8 TAPE:**

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

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION - GENERAL**

- A. Install insulation with the vapor barrier facing the heated side, unless specified otherwise.



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

### **3.2 PERIMETER INSULATION:**

- A. Vertical insulation:
  - 1. Fill joints of insulation with same material used for bonding.
  - 2. Bond polystyrene board to surfaces with adhesive or Portland cement mortar mixed and applied in accordance with recommendations of insulation manufacturer.
  - 3. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.

### **3.3 EXTERIOR FRAMING OR FURRING BLANKET INSULATION:**

- A. Pack insulation around door frames and windows and in building expansion joints, door soffits and other voids. Pack behind outlets around pipes, ducts, and services encased in walls. Open voids are not permitted. Hold insulation in place with pressure sensitive tape.
- B. Lap vapor retarder flanges together over face of framing for continuous surface. Seal all penetrations through the insulation.
- C. Fasten blanket insulation between metal studs or framing and exterior wall furring by continuous pressure sensitive tape along flanged edges.
- D. Ceiling Insulation and Soffit Insulation:
  - 1. Fasten blanket insulation between wood framing or joist with nails or staples through flanged edges of insulation.
  - 2. At metal framing or ceilings suspension systems, install blanket insulation above suspended ceilings or metal framing at right angles to the main runners or framing. Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.
  - 3. In areas where suspended ceilings adjoin areas without suspended ceilings, install either blanket, batt, or mineral fiberboard extending from the suspended ceiling to underside of deck or slab above. Secure in place to prevent collapse or separation of hung blanket, batt, or board insulation and maintain in vertical

position. Secure blanket or batt with continuous cleats to structure above.

**3.4 RIGID INSULATION ON SURFACE OF EXTERIOR WALLS, FLOORS, AND UNDERSIDE OF FLOORS:**

- A. On the interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to the face of studs for interior wall finish where shown.
- B. Bond to solid vertical surfaces with adhesive as recommended by insulation manufacturer. Fill joints with adhesive cement.

**3.5 ACOUSTICAL INSULATION:**

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

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

- A. Wood cants, blocking, and edge strips: Section 06 10 00, ROUGH CARPENTRY.
- B. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.
- C. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

**1.3 APPLICABLE PUBLICATIONS**

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

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

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Thermal Performance: Provide roof insulation meeting minimum overall  
average R-value of 25, with minimum R-value at any location of 10.

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

#### **1.5 QUALITY CONTROL**

- A. Requirements of Division 07 roofing section for qualifications of roofing system insulation Installer; Work of this Section shall be performed by same Installer.
- B. Requirements of Division 07 roofing section for inspection of Work of this Section and qualifications of Inspector.
- C. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.
- D. Requirements of roofing system uplift pressure design for specified roofing system.
- E. Requirements of applicable FM Approval for specified roofing system insulation attachment.
- F. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to [www.biopreferred.gov](http://www.biopreferred.gov).

#### **1.6 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data:
  - 1. Asphalt and adhesive materials, each type.
  - 2. Roofing cement, each type.
  - 3. Roof insulation, each type.
  - 4. Substrate board, each type.
  - 5. Cover board, each type.
  - 6. Fastening requirements.
  - 7. Insulation span data for flutes of metal decks.
- C. LEED Submittals:
  - 1. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.
- D. Shop Drawings: Include plans, sections, details, and attachments.
  1. Nailers, cants, and terminations.
  2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.
- E. Samples:
  1. Roof insulation, each type.
  2. Nails and fasteners, each type.
- F. Certificates:
  1. Indicating type, thermal conductance, and minimum and average thickness of insulation.
  2. Indicating materials and method of application of insulation system meet the requirements of FM Approvals for specified roofing system.
- G. Laboratory Test Reports: Thermal values of insulation products.
- H. Layout of tapered roof system showing units required.
- I. Documentation of supervisors' and inspectors' qualifications.

#### **1.7 DELIVERY, STORAGE AND MARKING**

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

#### **1.8 QUALITY ASSURANCE**

- A. Roof insulation on combustible or steel decks shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E84, or shall have successfully passed FM Approvals 4450.
  1. Insulation bearing the UL label and listed in the UL Building Materials Directory as meeting the flame spread and smoke developed ratings will be accepted in-lieu-of copies of test reports.
  2. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof

construction assembly of the particular type used for this project and the construction is listed as fire-classified in the UL Building Materials Directory or listed as Class I roof deck construction in the FM Approvals "RoofNav."

3. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

## **PART 2 - PRODUCTS**

### **2.1 ADHESIVE MATERIALS**

- A. Adhesive Materials, General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
  1. Liquid-type adhesive materials shall comply with VOC limits of authorities having jurisdiction.
  2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Plastic Foam Adhesives: 50 g/L.
    - b. Multipurpose Construction Adhesives: 70 g/L.
    - c. Fiberglass Adhesives: 80 g/L.
    - d. Contact Adhesives: 80 g/L.
    - e. Other Adhesives: 250 g/L.
    - f. Nonmembrane Roof Sealants: 300 g/L.
    - g. Sealant Primers for Nonporous Substrates: 250 g/L.
    - h. Sealant Primers for Porous Substrates: 775 g/L.
- B. Primer: ASTM D41.
- C. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.
- D. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- E. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- F. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component

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

- G. Roof Cement: Asbestos free, ASTM D2822, Type I or Type II; or, D4586, Type I or Type II.

## **2.2 ROOF AND DECK INSULATION**

- A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Roof Insulation System:
1. Fabricate of polyisocyanurate. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
  2. Cut to provide high and low points with crickets and slopes as shown.
  3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
  4. Minimum slope 1:48 (1/4 inch per 12 inches).

## **2.3 INSULATION ACCESSORIES**

- A. Glass (Felt): ASTM D2178, Type VI, heavy duty ply sheet.
- B. Cants and Tapered Edge Strips:
1. Wood Cant Strips: Refer to Division 06 Section "Rough Carpentry."
  2. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
  3. Tapered Edge Strips: 1:12 (one inch per foot), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
    - a. Cellulosic Fiberboard: ASTM C208.
    - b. Mineral Fiberboard: ASTM C726.
    - c. Perlite Board: ASTM C728.
- C. Substrate Board:
1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 13 mm (1/2 inch) thick, factory primed.
- D. Cover Board:
1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 13 mm (1/2 inch) thick, factory primed.



## **2.4 FASTENERS**

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

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

Comply with requirements of Division 07 roofing section.

### **3.2 PREPARATION**

Comply with requirements of Division 07 roofing section.

### **3.3 SUBSTRATE BOARD INSTALLATION**

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

### **3.4 RIGID INSULATION INSTALLATION**

#### **A. Insulation Installation, General:**

1. Install roof insulation in accordance with roofing system manufacturer's written instructions.
2. Install roof insulation in accordance with requirements of FM Approval's Listing for specified roofing system.
3. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate prior to installation of insulation.
4. Cant Strips: Install preformed insulation cant strips or wood cant strips specified in Division 06 Section ROUGH CARPENTRY at junctures of roofing system with vertical construction.
5. Use same insulation as existing for roof repair and alterations unless specified otherwise.

#### **B. Insulation Thickness:**

1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.
2. Insulation on Metal Decks: Provide minimum thickness of insulation for metal decks recommended by the insulation manufacturer to span

rib opening (flute size) of metal deck used. Support edges of insulation on metal deck ribs.

3. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, gravel stops, fascias and similar items at no additional cost to the Government.
  4. Where tapered insulation is used, the thickness of the insulation at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 38 mm (1-1/2 inches).
  5. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).
- C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.
- D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.
- E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.
- F. Cut to fit tight against blocking or penetrations.
- G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.
- H. Installation Method:
1. Mechanically Fastened and Adhered Insulation:
    - a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
    - b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.
  2. Cover Board: Install cover boards over insulation with long joints in continuous straight lines with staggered end joints. Offset cover board joints from insulation joints minimum 150 mm (6 inches). Fasten cover boards according to "Mechanically Fastened Insulation" requirements.

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**SECTION 07 24 00**  
**EXTERIOR INSULATION AND FINISH SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

Exterior Finish Systems specified in this section consist of a Direct Exterior Finish Systems (DEFS) and Exterior Insulation and Finish System (EIFS) all of which are applied over water resistant glass mat gypsum sheathing or concrete masonry units.

**1.2 RELATED WORK**

- A. Roof System Intersections: Section 07 61 16, SNAP-ON BATTEN STANDING SEAM ROOFING.
- B. Synthetic Veneer Cast Stone Masonry: Section 04 72 00, CAST STONE MASONRY.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:

Two 300 mm (one-foot) square samples of the EIFS finishes over water resistant gypsum sheathing identical to the proposed installation in thickness, color, texture and workmanship.
- C. Test Reports and Manufacturer's Literature
  - 1. Manufacturer's literature and instructions for installation of the system. Include manufacturer's recommended details for corner treatment, sills, soffits, dentils, quoins, lintels, openings and other special applications.
  - 2. Summary of test results by the Exterior Finish System manufacturer to substantiate compliance with the specified performance requirements. Furnish complete test reports as required.
  - 3. Statement by Exterior Finish System manufacturer that all components of the system proposed for use on this project are approved by that manufacturer.
  - 4. Statement by the Installer of the Exterior Finish System that they are experienced with the installation, having done at least three (3) projects using this system and can furnish names and locations of these projects if required.

#### **1.4 DELIVERY AND STORAGE**

- A. Deliver materials in unopened packages with manufacturer's labels intact, legible and grade seals unbroken.
- B. Store and handle in strict compliance with manufacturer's instructions. Protect from damage.
- C. Remove from premises any damaged or deteriorated material.

#### **1.5 ENVIRONMENTAL CONDITIONS**

Unless a higher temperature is required by the system manufacturer, the ambient air temperature shall be 7 degrees Celsius (45 degrees F) or greater and rising at the time of installation of the system and shall be predicted to remain at 7 degrees Celsius (45 degrees F) or greater for at least 24 hours after installation.

#### **1.6 WARRANTY**

Exterior Finish system shall be warranted against water leakage past the weather resistive barrier and other defects in materials and workmanship, and shall be subject to the terms of Article "Warranty of Construction", FAR clause 52.246-21.

#### **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):
  - B117-07.....Operating Salt Spray (Fog) Apparatus
  - C67-07.....Sampling and Testing Brick and Structural Clay Tile
  - C177-04.....Steady-State Heat Flux measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
  - C297-04.....Flatwise Tensile Strength of Sandwich Constructions
  - C578-07.....Rigid, Cellular Polystyrene Thermal Insulation
  - C666-03.....Resistance of Concrete to Rapid Freezing and Thawing
  - C920-05.....Elastomeric Joint Sealants
  - D968-05(R2007).....Abrasion Resistance of Organic Coatings by Falling Abrasive

- D2794-93(R2004).....Resistance of Organic Coatings to the Effects  
of Rapid Deformation (Impact)
- E84-07.....Surface Burning Characteristics of Building  
Materials
- E96-05.....Water Vapor Transmission of Materials
- E108-07.....Fire Tests of Roof Coverings
- E330-02.....Structural Performance of Exterior Windows,  
Curtain Walls, and Doors by Uniform Static Air  
Pressure Difference
- E331-00.....Water Penetration of Exterior Windows, Curtain  
Walls, and Doors by Uniform Static Air Pressure  
Difference
- G90-05.....Accelerated Outdoor Weathering of Nonmetallic  
Materials Using Concentrated Natural Sunlight
- C. Exterior Insulation Manufacturers Association (EIMA)
- 101.86-1992.....Resistance of Exterior Insulation and Finish  
Systems to the Effects of Rapid Deformation  
(Impact)

#### **1.8 SAMPLE PANEL**

- A. Before starting EIFS work, lay up 2 sample panels (one for drainable EIFS and one for non-drainable EIFS), of each different texture and color, at areas indicated on the Drawings.
  - 1. Use textures and colors as indicated in the Drawings.
  - 2. Include all specified system components.
- B. Use sample panels approved by Contracting Officer's Technical Representative for standard of workmanship of new EIFS work.
- C. Use sample panel to test cleaning methods.
- D. Sample panel, if approved, by the Architect and Contracting Officer's Technical Representative, can be left in place as part of the finished project.

### **PART 2 PRODUCTS**

#### **2.1 WATER-RESISTIVE BARRIER**

Product: EIFS system's recommended barrier, or  
Contracting Officer's Technical Representative's approved  
equal.

## **2.2 EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)**

- A. Description: The PB system consists of Type I molded rigid, extruded, polystyrene insulation (R-5 per inch thickness) adhesively adhered to the sheathing, or concrete masonry units, and finished with a glass-fiber-mesh reinforced based-coat and a textured finish coat. Basis-of-Design Product: Outsulation X System by Dryvit Systems, Inc.; or, COTR approved equal system. All components shall be obtained from the approved manufacturer or their authorized distributor.

B. Performance Requirements:

TEST	TEST METHOD	REQUIREMENT
Flame Spread (Test samples shall include base coat, fabric, finish mounted on non- combustible substrate)	ASTM E84	Flame spread of 25 or less. Smoke developed rating 450 or less.
Full Scale Wall Fire Test	ASTM E108	No significant surface flaming or propagation of vertical or lateral flames
Impact Resistance (Sample shall be cured. Finish, base coat and fabric over 25mm (1 inch) insulation typical of project application)	EIMA 101.86 (Hemispherical Head Test)	//Standard Impact Resistance// 2.83 to 5.54J (25-49 inch-lbs) Medium Impact Resistance// 5.65 to 10.1J 50-89 inch lbs
		High Impact Resistance// 10.2 to 17J (90-150 inch-lbs) Ultra High Impact Resistance// Over 17.1J (Over 150 inch-lbs.) - No broken reinforcing fabric
Structural Performance (Test panels 1200 mm x 1200 mm (4 feet by 4 feet) typical of project application)	ASTM E330	No permanent deformation, delamination or deterioration for positive and negative pressures as required.
Water Penetration	ASTM E331	No Water penetration
Abrasion Resistance	ASTM D968	500 liters of sand-slight smoothing - no loss of film integrity
Accelerated Weathering	ASTM G90	2000 hours. No deterioration
Salt Spray Resistance	ASTM B117	Withstand 300 hours. No deleterious effects.
Water Vapor	ASTM E96	Not more than 18 grains an hour per square foot.
Absorption-Freeze-Thaw (Pre-weighed 100 mm x 200 mm (4" by 8") specimens; 25 mm (1") insulation, faced with finish coat cured and	ASTM C67 50 Cycles: 20 hrs. at - 9 deg C ; 4-hr. thaw in water	After 50 cycles - Total weight gain of not more than 6.2 grams. No checking splitting, or cracking.

stored in air; tested with edges and back open.)		
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- C. Adhesive: Manufacturers standard product including primer as required compatible with sheathing.
- D. Insulation:
1. Thermal Resistance: Thermal resistance (R-value), as indicated, measured by ASTM C177.
  2. Insulating Material: ASTM C578, as recommended by EIFS manufacturer, and treated to be compatible with EIFS components. Age insulation a minimum of 6 weeks prior to installation.
  3. Provide Extruded Polystyrene (EPS) insulation board, in sizes as required to provide a manufacturer approved system. Basis-of-Design Product: Dow Xenergy Foam Board, as part of EIFS finish system.
- E. Create a means of drainage between the insulation board and water resistant gypsum board sheathing, providing a drainable system; provide a non-drainable system where insulation is attached to concrete masonry units.
- F. All penetrations and terminations shall be flashed.
- G. Mechanical Anchors: As recommended by the EIFS manufacturer.
- H. Accessories: Conform to the recommendations of the EIFS manufacturer, including trim, edging, anchors, expansion joints, and other items required for proper installation of the EIFS. All metal items and fasteners to be corrosion resistant. Use beveled-groove tool, to create horizontal reveals.
- I. Reinforcing Fabric: Balanced, open weave, glass fiber fabric made from twisted multi-end strands specifically treated for compatibility with the other materials of the system. Minimum weight 6.0 oz/sq. yd.
- J. Base Coat: For PB system, manufacturer's standard product. Minimum thickness of 1-1/2 times reinforcing fabric thickness but not less than 2.4 mm (3/32 inches) wet thickness.
- K. Finish Coat: For PB system, manufacturer's standard product. Minimum thickness 1.6 mm (1/16 inch), complying with Performance Requirements in paragraph B.



- L. Sealant: ASTM C 920; material having a minimum joint movement of 50% with 100% recovery. Type, grade and use shall be as recommended by the sealant manufacturer. When required, primer, bond breaker and backer rods shall be non-staining as recommended by the sealant manufacturer. Do not use absorptive materials as backer rods.

## **PART 3 EXECUTION**

### **3.1 INSPECTION**

Examine substrate, opening supports and conditions under which this work is to be performed. Notify Contracting Officer's Technical Representative in writing of conditions detrimental to the proper completion of this work. Do not proceed with work until unsatisfactory conditions have been corrected. Coordinate work that intersects flashing work of the standing seam metal roofing contractor, and the adhered manufactured stone masonry veneer (AMSMV) contractor.

### **3.2 CONTROL JOINTS**

- A. See drawings for location of building control joints and surface control joints. Install surface control joints as follows:
- B. Direct Exterior Finish: Install at 6 meters (20 feet) o.c. maximum in either direction, erecting the continuous vertical joints first at building expansion joints, intersection of dissimilar substrates or finishing materials where concentrated stresses or movement is anticipated. Leave a 13 mm (1/2") minimum continuous gap between board panels to receive control joint.
- C. Exterior Insulation and Finish System. Install at 15 meters (50 feet) maximum in both directions and at building expansion joints, floor lines and where EIFS intersects other materials per manufacturer's recommendations.

### **3.3 SEALANTS:**

- A. Apply according to manufacturer's recommendations and the following:
- B. Direct Exterior Finish System: Caulk all intersections of cement board with windows, doors, control joints, other openings and locations as shown on drawings. Do not caulk locations intended for water drainage.
- C. Exterior Insulation and Finish System: Apply sealant per EIFS manufacturer's recommendation. Do not seal locations intended for water drainage.

### **3.4 ACCESSORIES:**

Install according to manufacturer's recommendation.

### **3.5 FINISH:**

#### **A. EXTERIOR INSULATION AND FINISH SYSTEM:**

1. Insulation Board: Place horizontally from level base line. Stagger vertical joints and interlock at corners. Butt joints tightly. Provide flush surfaces at joints. Offset insulation board joints from joints in sheathing by at least 200 mm (8 inches). Do not align joints with corners of doors, windows and other openings. Do not leave insulation board exposed longer than recommended by insulation manufacturer. Adhere (fasten) insulation board to substrate per manufacturer's recommendations, and for each, different, substrate
2. Sanding: Sand entire surface of insulation before application of base coat to improve bonding of basecoat, level high joints and remove dirt and weathering damage. Do not pre-fill low areas with basecoat.
3. Base Coat and Reinforcing Fabric: Trowel apply to the insulation a uniform thickness of base coat as recommended by the system manufacturer but not less than 1-1/2 times the reinforcing fabric thickness with a minimum of 2.4 mm (3/32 inch). Install reinforcing fabric in accordance with manufacturer's instructions. Provide diagonal reinforcement at opening corners, backwrapping, and any other reinforcement recommended by EIFS manufacturer. The fabric shall not be visible beneath the surface of the basecoat after installation. Cure the basecoat for a minimum of 24 hours before application of the finish coat.
4. Finish: Inspect basecoat for damage or defects and repair prior to application of finish coat. Trowel apply finish coat according to manufacturer's recommendations but a minimum of 1.6 mm (1/16 inch). Texture finish as required. Provide finish surfaces that are plumb and plane with no greater deviation than 1:500 (1/4 inch in 10 feet).

### **3.6 CLEAN UP:**

Upon completion, remove all scaffolding, equipment, materials and debris from site. Remove all temporary protection installed to facilitate installation of system.

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**SECTION 07 42 64**  
**METAL-FACED COMPOSITE WALL PANELS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.1 SUMMARY**

- A. Section includes metal-faced composite wall panels.
- B. Related Sections:
  - 1. Section 05 40 00, COLD-FORMED METAL FRAMING, for cold-formed metal framing supporting metal-faced composite wall panels.
  - 2. Section 07 60 00, FLASHING AND SHEET METAL, for field-formed flashings and other sheet metal work not part of metal-faced composite wall panel assemblies.

**1.2 DEFINITION**

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

**1.3 PERFORMANCE REQUIREMENTS**

- A. General Performance: Metal-faced composite wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural Performance: Provide metal-faced composite wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
  - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
    - a. Uniform pressure of 20 lbf/sq. ft., acting inward or outward.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints,

overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal-faced composite wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal-faced composite wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.
  1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
    - a. Flashing and trim.
    - b. Anchorage systems.
- C. Samples for Initial Selection: For each type of metal-faced composite wall panel indicated with factory-applied color finishes.
  1. Include similar Samples of trim and accessories involving color selection.
  2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  1. Metal-Faced Composite Wall Panels: Minimum 12 x 12 inches (300 x 300 mm). Include fasteners, closures, and other metal-faced composite wall panel accessories.
    - a. Composite Panels: Include four-way joint.
  2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
  3. Accessories: 12-inch- (300-mm-) long Samples for each type of accessory.
  4. Exposed Gaskets: 12 inches (300 mm) long.
  5. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of

material matching the appearance of metal-faced composite wall panels adjacent to joint sealants.

- E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
  - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- G. Field quality-control reports.

#### **1.5 QUALITY ASSURANCE**

Source Limitations: Obtain each type of metal-faced composite wall panel from single source from single manufacturer.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

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

#### **1.7 PROJECT CONDITIONS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal-faced composite wall panels to be performed according to manufacturer's written instructions and warranty requirements.

- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal-faced composite wall panel fabrication and indicate measurements on Shop Drawings.

## **1.8 COORDINATION**

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

## **PART 2 - PRODUCTS**

### **2.1 PANEL MATERIALS**

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
  - 1. Surface: Smooth, flat finish.
  - 2. Exposed Coil-Coated Finishes:
    - a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- B. Panel Sealants:
  - 1. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal-faced composite wall panels and remain weathertight; and as recommended in writing by panel manufacturer.

### **2.2 MISCELLANEOUS METAL FRAMING**

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G40 (Z120) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Subgirts: Manufacturer's standard C- or Z-shaped sections 0.064-inch (1.63-mm) nominal thickness.

- C. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.
- D. Hat-Shaped, Rigid Furring Channels:
  - 1. Nominal Thickness: As required to meet performance requirements 0.040 inch (1.02 mm).
  - 2. Depth: As indicated.
- E. Cold-Rolled Furring Channels: Minimum 1/2-inch- (13-mm-) wide flange.
  - 1. Nominal Thickness: As required to meet performance requirements.
  - 2. Depth: 3/4 inch (19 mm).
  - 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch (1.02 mm).
  - 4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.57-mm-) diameter wire, or double strand of 0.048-inch- (1.22-mm-) diameter wire.
- F. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

## **2.3 MISCELLANEOUS MATERIALS**

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

## **2.4 METAL-FACED COMPOSITE WALL PANELS**

- A. General: Provide factory-formed and -assembled, metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system. System shall be rout and return with wet-sealed joints.
  - 1. Fire-Retardant Core: Noncombustible, with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 450 or less.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Alcan Composites USA Inc.; Alucobond.
- b. Alcoa Inc.; Reynobond PE., Basis-of-Design Product.
- c. ALPOLIC, Division of Mitsubishi Chemical America, Inc.
- d. CENTRIA Architectural Systems; Formabond Wall System.
- e. Citadel Architectural Products, Inc., Envelope 2000 (RS).
- f. Copper Sales, Inc.; UNA-FAB Series 1000.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, **coil-coated** aluminum sheet facings.

- 1. Panel Thickness: 0.236 inch (6 mm).
- 2. Core: Standard.

3. Exterior Finish: **3-coat** fluoropolymer.

- a. Color: As selected by Architect from manufacturer's full range.

C. Attachment System Components: Formed from material **compatible** with panel facing.

- 1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips, and anchor channels.

## 2.5 ACCESSORIES

A. Flashing and Trim: Formed from 0.018-inch- (0.46-mm-) minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.

## 2.6 FABRICATION

A. General: Fabricate and finish metal-faced composite wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.



- B. Metal-Faced Composite Wall Panels: Factory form panels in a batch process by laminating each sheet using glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.
1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
  2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
  3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
  4. Dimensional Tolerances:
    - a. Panel Bow: 0.8 percent maximum of panel length or width.
    - b. Squareness: 0.25 inch (5 mm) maximum.
- C. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
  5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal-faced composite wall panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal-faced composite wall panel manufacturer for application, but not less than thickness of metal being secured.

## **2.7 GENERAL FINISH REQUIREMENTS**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

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

### 3.3 METAL-FACED COMPOSITE WALL PANEL INSTALLATION

- A. General: Install metal-faced composite wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Commence metal-faced composite wall panel installation and install minimum of 100 sq. ft. in presence of factory-authorized representative.
  - 2. Shim or otherwise plumb substrates receiving metal-faced composite wall panels.
  - 3. Flash and seal metal-faced composite wall panels at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
  - 4. Install flashing and trim as metal-faced composite wall panel work proceeds.
  - 5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
  - 6. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:
  - 1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal-faced composite wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal-faced composite wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.
  - 1. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- E. Attachment System Installation, General: Install attachment system required to support metal-faced composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
  - 1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
  - 2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.

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

### **3.4 ACCESSORY INSTALLATION**

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal-faced composite wall panel assembly including trim, copings, corners, seam

covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

### **3.5 ERECTION TOLERANCES**

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

### **3.6 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and adjust completed metal-faced composite wall panel installation, including accessories.
- B. Metal-faced composite wall panels will be considered defective if they do not pass inspections.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare inspection reports.

### 3.7 CLEANING

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

--- END ---

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

**PART 1 GENERAL**

**1.1 DESCRIPTION**

Ethylene Propylene Diene Monomer (EPDM) sheet roofing adhered to roof deck.

**1.2 RELATED WORK**

- A. Treated wood framing, blocking, and nailers: Section 06 10 00, ROUGH CARPENTRY.
- B. Roof Insulation: Section 07 22 00, ROOF AND DECK INSULATION.
- C. Roof to EIFS intersections: Section 07 24 00, EXTERIOR INSULATION AND FINISH SYSTEMS.
- D. Metal cap flashings, copings, fascias, and expansion joints: Section 07 60 00, FLASHING AND SHEET METAL.
- E. Flashings, underlayments, and metal roofs: 07 61 16, SNAP-ON BATTEN STANDING SEAM METAL ROOFING.
- F. Roof hatches, equipment supports, dome type skylights, and gravity ventilators: Section 07 72 00, ROOF ACCESORIES.
- G. Mechanical equipment supports: Section 23 34 00, HVAC FANS and Section 23 31 00, HVAC DUCTS AND CASINGS, Section 23 37 00, AIR OUTLETS AND INLETS.

**1.3 QUALITY ASSURANCE**

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

would prevent application of roofing system from commencing or cause a roof failure.

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

#### **1.4 SUBMITTALS**

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

#### **1.5 DELIVERY, STORAGE AND HANDLING**

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

#### **1.6 WARRANTY**

Roofing work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21.

In addition, the roof shall have a warranty period of twenty (20) years for leaks to include all materials and labor.

#### **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
  - B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
  - D751-06.....Coated Fabrics
  - D2103-05.....Polyethylene Film and Sheeting
  - D2240-05.....Rubber Property - Durometer Hardness



D3884-07.....Abrasive Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)

D4637-04.....EPDM Sheet Used in Single-Ply Roof Membrane

D4586-07.....Asphalt Roof Cement, Asbestos Free

E96-05.....Water Vapor Transmission of Materials

E108-07.....Fire Tests of Roof Coverings

G21-96 (R2002).....Resistance of Synthetic Polymeric Materials to Fungi

- C. National Roofing Contractors Association (NRCA):  
Fifth Edition - 05.....The NRCA Roofing and Waterproofing Manual.
- D. Federal Specifications (Fed. Spec.)  
FF-S-107C(2).....Screws, Tapping and Drive  
FF-S-111D(1).....Screw, Wood  
UU-B-790A.....Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent and Fire Resistant)
- E. Factory Mutual Engineering and Research Corporation (FM):  
Annual Issue.....Approval Guide Building Materials
- F. Underwriters Laboratories, Inc (UL):  
Annual Issue.....Building Materials Directory  
Annual Issue.....Fire Resistance Directory
- G. Warnock Hersey (WH):  
Annual Issue.....Certification Listings

## **PART 2 - PRODUCTS**

### **2.1 EPDM SHEET ROOFING**

- A. Conform to ASTM D4637, Type I, Grade 1, white color
- B. Additional Properties:

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

- C. Thickness:
1. Use 1.52 mm (0.060-inch) thick sheet for adhered system

D. Pipe Boots:

1. Molded EDPM designed for flashing of round penetrations, 200 mm (8 inch) minimum height.
2. Color same as roof membrane.

**2.2 EPDM FLASHING SHEET**

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

**2.3 MISCELLANEOUS ROOFING MEMBRANE MATERIALS**

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

**2.4 WALKWAY PADS**

- A. Rubber walkway pad approximately 450 mm x 450 mm (30 by 30 inches) square or manufacturers' standard size with rounded corners.
- B. Approximately 13 mm (1/2 inch) thick.
- C. Ultraviolet light stabilized.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Do not apply if deck will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless protection provided to distribute loads less than one-half compression resistance of roofing system materials.
  1. Curbs, blocking, edge strips, and other components to which roofing and base flashing is attached in place ready to receive insulation and, roofing.

2. Coordinate roof operation with sheet metal work and roof insulation work so that insulation and flashing are installed concurrently to permit continuous roofing operations.
  3. Complete installation of flashing, insulation, and roofing in the same day except for the area where temporary protection is required when work is stopped.
  4. Coordinate work with that of the standing seam metal roofing contractor.
- B. Phased construction is not permitted. The complete installation of roofing system is required in the same day except for area where temporary protection is required when work is stopped. Complete installation includes pavers and ballast for ballasted systems.
- C. Dry out surfaces, including the flutes of metal deck, that become wet from any cause during progress of the work before roofing work is resumed.
- D. Apply materials only to dry substrates.
- E. Except for temporary protection specified, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, fog, ice, or frost) is present in any amount in or on the materials.
1. Do not apply materials to substrate having temperature of 4°C (40 degrees F) or less, or when materials applied with the roof require higher application temperature.
  2. Do not apply materials when the temperature is below 4°C (40 degrees F).
- F. Temporary Protection:
1. Install temporary protection consisting of a temporary seal and water cut-offs at the end of each day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent.
  2. Temporarily seal exposed surfaces of insulation within the roofing membrane.
  3. Do not leave insulation surfaces or edges exposed.
  4. Use polyethylene film or building paper to separate roof sheet from bituminous materials.
  5. Apply the temporary seal and water cut off by extending the roof membrane beyond the insulation and securely embedding the edge of the roof membrane in 6 mm (1/4 inch) thick by 50 mm (2 inches) wide strip of temporary closure sealant (night sealant) and weight edge with sandbags, to prevent displacement; space sandbags not over 2400 mm (8

- foot) centers. Check daily to insure temporary seal remains watertight. Reseal open areas and weight down.
6. Before the work resumes, cut off and discard portions of the roof membrane in contact with roof cement or bituminous materials.
    - a. Cut not less than 150 mm (6 inches) back from bituminous coated edges or surfaces.
    - b. Remove temporary polyethylene film or building paper.
  7. Remove and discard sandbags contaminated with bituminous products.
  8. For roof areas that are to remain intact and that are subject to foot traffic and damage, provide temporary wood walkways with notches in sleepers to permit free drainage.
  9. Provide 2 mm (6 mil) polyethylene sheeting or building paper cover over roofing membrane under temporary wood walkways and adjacent areas. Round all edges and corners of wood bearing on roof surface.

### **3.2 PREPARATION**

- A. Test pull out resistance of fasteners in deck in the presence of the COTR before starting roofing work. Tests are not required for wood.
  1. Test applicable fastener type in applicable deck.
  2. Install fasteners through a sample of the insulation, if any is to be used, into the structural deck.
  3. Test the pull out resistance with a pull out tester.
  4. Test one fastener in each deck level and one for every 230 m<sup>2</sup> (2500 square feet) of deck type and level.
  5. Test at locations designated by COTR.
  6. Do not proceed with the roofing work if the pull out resistance of the fasteners is less than specified.
  7. Test results:
    - a. Repeat tests using other type fasteners or use additional fasteners to stay within the pullout load resistance criteria.
    - b. Patch cementitious deck to repair areas of fastener tests holes.//
- B. Remove dirt, debris, and surface moisture. Cover or fill voids greater than 6 mm (1/4 inch) wide to provide solid support for roof membrane.
- C. Install separation sheet over bituminous material on deck surface lapping edges and ends 150 mm (6 inches) or as recommended by roof membrane manufacturer.
  1. Do not install of separation sheet beyond what can be covered by roofing membrane each day.
  2. Use polyethylene, or building paper, that will be compatible with seaming method.

3. Insure separation sheet completely isolates bituminous materials from EPDM roofing membrane.
4. Turn up at penetrations, or other surfaces where bituminous materials occur, to cover bituminous product.
5. Turn down over edges of blocking at perimeters to cover blocking.

### **3.3 INSTALLATION OF ROOFING AND FLASHING**

- A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with EPDM roofing membrane.
- B. If possible, install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.
- C. If possible, start at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet. Coordinate with roof insulation installation.
- D. Position the membrane so it is free of buckles and wrinkles.
- E. Roll sheet out on deck; inspect for defects as sheet is being rolled out and remove defective areas:
  1. Allow 30 minutes for relaxing before proceeding.
  2. Lap edges and ends of sheets 75 mm (3 inches) or more as recommended by the manufacturer. Clean lap surfaces as specified by manufacturer.
  3. Adhesively splice laps. Apply pressure as required. Seam strength of laps as required by ASTM D4637.
  4. Check seams to ensure continuous adhesion and correct defects.
  5. Finish edges of laps with a continuous beveled bead of lap sealant to sheet edges to provide smooth transition as specified by manufacturer.
  6. Finish seams as the membrane is being installed (same day).
  7. Anchor perimeter to deck or wall as specified.
- F. Adhered System:
  1. Apply bonding adhesive in quantities required by roof membrane manufacturer.
  2. Fold sheet back on itself, clean and coat the bottom side of the membrane and the top of the deck with adhesive. Do not coat the lap joint area.
  3. After adhesive has set according to adhesive manufacturer's application instruction, roll the membrane into the adhesive in manner that minimizes voids and wrinkles.
  4. Repeat for other half of sheet. Cut voids and wrinkles to lay flat and clean for repair patch over cut area.

G. Install flashings as the membrane is being installed (same day). If the flashing cannot be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.

H. Flashing Roof Drains:

1. Install roof drain flashing as recommended by the membrane manufacturer, generally as follows:
  - a. Coordinate to set the metal drain flashing in asphalt roof cement, holding cement back from the edge of the metal flange.
  - b. Do not allow the roof cement to come in contact with the EPDM roof membrane.
  - c. Adhere the EPDM roof membrane to the metal flashing with the membrane manufacturer's recommended bonding adhesive.
2. Turn down the metal drain flashing and EPDM roof membrane into the drain body and install clamping ring and stainer.

I. Installing EPDM Base Flashing and Pipe Flashing:

1. Install EPDM flashing membranes to pipes, walls or curbs to a height not less than 200 mm (8 inches) above roof surfaces and 100 mm (4 inches) on roof membranes. Install in accordance with NRCA manual:
  - a. Adhere flashing to pipe, wall or curb with bonding adhesive.
  - b. Form inside and outside corners of EPDM flashing membrane in accordance with NRCA manual (Fifth Edition). Form pipe flashing in accordance with NRCA manual (Fifth Edition).
  - c. Lap ends not less than 100 mm (4 inches).
  - d. Adhesively splice flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.
2. Anchor top of flashing to walls or curbs with fasteners spaced not over 150 mm (6 inches) on center. Use surface mounted fastening strip with sealant on ducts. Use pipe clamps on pipes or other round penetrations.
3. Apply sealant to top edge of flashing.

J. Installing Building Expansion Joints:

1. Install base flashing on curbs as specified.
2. Coordinate installation with metal expansion joint cover or roof expansion joint system.
3. Install flexible tubing 1-1/2 times width of joint over joint. Cover tubing with EPDM cover strip adhered to base flashing and lapping

base flashing 100 mm (4 inches). Finish edges of laps with sealants as specified.

K. Repairs to membrane and flashings:

1. Remove sections of EPDM sheet roofing or flashing that is creased wrinkled or fishmouthed.
2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (4 inches) beyond damaged, cut, or removed area. Adhesively splice to roof membrane or flashing. Finish edge of lap with sealant as specified.

**3.4 WALKWAY PADS**

- A. Clean membrane where pads are applied.
- B. Adhere pads to membrane with splicing cement.
- C. Allow not less than 1 inch break between pads and 2 inch maximum break.

**3.5 FIELD QUALITY CONTROL**

- A. Examine and probe seams in the membrane and flashing in the presence of the COTR and Membrane Manufacturer's Inspector.
- B. Probe the edges of welded seams with a blunt tipped instrument. Use sufficient hand pressure to detect marginal bonds, voids, skips, and fishmouths.
- C. Cut 100 mm (4 inch) wide by 300 mm (12 inch) long samples through the seams where directed by the COTR.
  1. Cut one sample for every 450 m (1500 linear feet) of seams.
  2. Cut the samples perpendicular to the longitudinal direction of the seams.
  3. Failure of the samples to maintain the standard of quality within a reasonable tolerance of the approved samples will be cause for rejection of the work.
- D. Repair areas of welded seams where samples have been taken or marginal bond voids or skips occur.
- E. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (4 inches) beyond cut.

**3.6 TEMPORARY ROOF**

- A. Install temporary roof when sequences of work or weather does not permit installation of a completed permanent roof system or roof would be subject to phasing of roof work, construction traffic, scaffolds, and work over roof area.
- B. Use of 1.15 mm (0.045-inch) thick non-reinforced EPDM membrane or other temporary membrane as approved.

- C. Install not less than 6 mm (1/4 inch) thick plywood underlayment over steel decks before installing temporary roof.
- D. Secure membrane to deck with mechanical fasteners or temporary ballast not exceeding deck dead load capacity.
- E. Repair cuts, tears, and punctures with patches to keep system watertight.
- F. Install permanent roof system within one year.

- - - E N D - - -



**SECTION 07 60 00**  
**FLASHING AND SHEET METAL**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

Formed sheet metal work for wall and roof flashing, gutters, and drainage specialties, are specified in this section.

**1.2 RELATED WORK**

- A. Manufactured flashing, copings, roof edge metal, expansion joints, and fasciae: Section 07 72 00 ROOF ACCESSORIES.
- B. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.
- C. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- D. Integral flashing components of manufactured roof specialties and accessories or equipment: Section 07 71 00, ROOF SPECIALTIES Section 07 72 00, ROOF ACCESSORIES, Division 22, PLUMBING sections and Division 23 HVAC sections.
- E. Flashing of Roof Drains: Section 22 14 00, FACILITY STORM DRAINAGE.

**1.3 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. Aluminum Association (AA):
  - AA-C22A41.....Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick
  - AA-C22A42.....Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick
  - AA-C22A44.....Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class I Architectural, 0.7-mil thick finish
- C. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):

- ANSI/SPRI ES-1-03.....Wind Design Standard for Edge Systems Used with  
Low Slope Roofing Systems
- D. American Architectural Manufacturers Association (AAMA):
- AAMA 620.....Voluntary Specification for High Performance  
Organic Coatings on Coil Coated Architectural  
Aluminum
- AAMA 621.....Voluntary Specification for High Performance  
Organic Coatings on Coil Coated Architectural  
Hot Dipped Galvanized (HDG) and Zinc-Aluminum  
Coated Steel Substrates
- E. ASTM International (ASTM):
- A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel  
Steel Plate, Sheet, and Strip
- A653/A653M-09.....Steel Sheet Zinc-Coated (Galvanized) or Zinc  
Alloy Coated (Galvanized) by the Hot- Dip  
Process
- B32-08.....Solder Metal
- B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
- B370-09.....Copper Sheet and Strip for Building  
Construction
- D173-03.....Bitumen-Saturated Cotton Fabrics Used in  
Roofing and Waterproofing
- D412-06.....Vulcanized Rubber and Thermoplastic Elastomers-  
Tension
- D1187-97(R2002).....Asphalt Base Emulsions for Use as Protective  
Coatings for Metal
- D1784-08.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and  
Chlorinated Poly (Vinyl Chloride) (CPVC)  
Compounds
- D3656-07.....Insect Screening and Louver Cloth Woven from  
Vinyl-Coated Glass Yarns
- D4586-07.....Asphalt Roof Cement, Asbestos Free
- F. Sheet Metal and Air Conditioning Contractors National Association  
(SMACNA): Architectural Sheet Metal Manual.
- G. National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500-06.....Metal Finishes Manual
- H. Federal Specification (Fed. Spec):
- A-A-1925A.....Shield, Expansion; (Nail Anchors)

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

I. International Code Commission (ICC): International Building Code,  
Current Edition

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
  - 1. Wind Zone 3: 2.20 to 4.98 kPa (46 to 104 lbf/sq. ft.): 9.96-kPa (208-lbf/sq. ft.) perimeter uplift force, 14.94-kPa (312-lbf/sq. ft.) corner uplift force, and 4.98-kPa (104-lbf/sq. ft.) outward force.
- B. Wind Design Standard: Fabricate and install roof-edge flashings tested per ANSI/SPRI ES-1 to resist design pressure indicated on Drawings.

#### **1.5 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: For all specified items, including:
  - 1. Flashings
  - 2. Gutter and Conductors
- C. Manufacturer's Literature and Data: For all specified items, including:
  - 1. Two-piece counterflashing
  - 2. Thru wall flashing
  - 3. Nonreinforced, elastomeric sheeting
  - 4. Copper clad stainless steel
- D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

### **PART 2 - PRODUCTS**

#### **2.1 FLASHING AND SHEET METAL MATERIALS**

- A. Stainless Steel: ASTM A167, Type 302B, dead soft temper.
- B. Copper ASTM B370, cold-rolled temper.

#### **2.2 FLASHING ACCESSORIES**

- A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.
- B. Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m<sup>2</sup> ( 6 lbs/100 sf).

C. Bituminous Paint: ASTM D1187, Type I.

D. Fasteners:

1. Use copper, copper alloy, bronze, brass, or stainless steel for copper and copper clad stainless steel, and stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.
2. Nails:
  - a. Minimum diameter for copper nails: 3 mm (0.109 inch).
  - b. Minimum diameter for aluminum nails 3 mm (0.105 inch).
  - c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
  - d. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.
3. Rivets: Not less than 3 mm (1/8 inch) diameter.
4. Expansion Shields: Fed Spec A-A-1925A.

E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.

F. Insect Screening: ASTM D3656, 18 by 18 regular mesh.

G. Roof Cement: ASTM D4586.

### **2.3 SHEET METAL THICKNESS**

A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:

B. Concealed Locations (Built into Construction):

1. Copper clad stainless steel: 0.25 mm (0.010 inch) thick.

C. Exposed Locations:

1. Copper clad stainless steel: 0.4 mm (0.015 inch).

### **2.4 FABRICATION, GENERAL**

A. Jointing:

1. In general, copper clad stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
2. Jointing of copper over 0.5 Kg (20 oz) weight or stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
3. Joints shall conform to following requirements:
  - a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.

- b. Lap joints subject to stress shall finish not less than 25 mm (one inch) wide and shall be soldered and riveted.
  - c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.
- 4. Flat and lap joints shall be made in direction of flow.
- 5. Soldering:
  - a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) of uncoated copper, stainless steel, and copper clad stainless steel.
  - b. Wire brush to produce a bright surface before soldering lead coated copper.
  - c. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
  - d. Completely remove acid and flux after soldering is completed.
- B. Expansion and Contraction Joints:
  - 1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
  - 2. Space joints as specified.
  - 3. Space expansion and contraction joints for copper clad stainless steel at intervals not exceeding 7200 mm (24 feet).
  - 4. Fabricate joint covers of same thickness material as sheet metal served.
- C. Cleats:
  - 1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
  - 2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
  - 3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
  - 4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.
- D. Edge Strips or Continuous Cleats:
  - 1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.

2. Except as otherwise specified, fabricate edge strips or minimum 0.6 mm (0.024 inch) thick stainless steel.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using 0.8 mm (0.031 inch) thick stainless steel.

E. Drips:

1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

F. Edges:

1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
3. All metal roof edges shall meet requirements of IBC, current edition.

G. Metal Options:

1. Where options are permitted for different metals use only one metal throughout.
2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.

## **2.5 FINISHES**

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
- C. Finish exposed metal surfaces as follows, unless specified otherwise:
  - 1. Copper: Mill finish.
  - 2. Stainless Steel: Finish No. 2B or 2D.

## **2.6 THROUGH-WALL FLASHINGS**

- A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.
  - 1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
  - 2. Fabricate so keying nests at overlaps.
- B. For Masonry Work When Concealed Except for Drip:
  - 1. Either copper, stainless steel, or copper clad stainless steel.
  - 2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
  - 3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.
- C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:
  - 1. Use same metal and thickness as counter flashing.
  - 2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
  - 3. Form exposed portion as snap lock receiver for counter flashing upper edge.
- D. Window Sill Flashing and Lintel Flashing:
  - 1. Use either copper, stainless steel, copper clad stainless steel plane flat sheet, or nonreinforced elastomeric sheeting, bituminous coated copper, copper covered paper, or polyethylene coated copper.
  - 2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
  - 3. Turn up back edge as shown.
  - 4. Form exposed portion with drip as specified or receiver.

## **2.7 BASE FLASHING**

- A. Use metal base flashing at vertical surfaces intersecting built-up roofing without cant strips or where shown.
  - 1. Use either copper, or stainless steel, thickness specified unless specified otherwise.
  - 2. When flashing is over 250 mm (10 inches) in vertical height or horizontal width use either 0.5 Kg (20 oz) copper or 0.5 mm (0.018 inch) stainless steel.
  - 3. Use stainless steel at aluminum roof curbs where flashing contacts the aluminum.
  - 4. Use either copper, or stainless steel at pipe flashings.
- B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).
- C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.
- D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.
- E. Pipe Flashing: (Other than engine exhaust or flue stack)
  - 1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
  - 2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
  - 3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
    - a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
    - b. Allow for loose fit around and into the pipe.
  - 4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
    - a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
    - b. Allow for loose fit around pipe.

## **2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)**

- A. Either copper or stainless steel, unless specified otherwise.
- B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:



1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
4. Manufactured assemblies may be used.
5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.

C. One-piece Counterflashing:

1. Back edge turned up and fabricate to lock into reglet in concrete.
2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).

D. Two-Piece Counterflashing:

1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
2. Counterflashing upper edge designed to snap lock into receiver.

E. Surface Mounted Counterflashing; one or two piece:

1. Use at existing or new surfaces where flashing can not be inserted in vertical surface.
2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.
3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.

- F. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

## **2.9 HANGING GUTTERS**

- A. Fabricate gutters of not less than the following:
1. (0.032 inch) thick aluminum.
- B. Fabricate hanging gutters in sections not less than 2400 mm (8 feet) long, except at ends of runs where shorter lengths are required.
- C. Building side of gutter shall be not less than 38 mm (1 1/2 inches) higher than exterior, or a dimension higher than the exterior side as approved by the COTR.
- D. Gutter Bead: Stiffen outer edge of gutter by folding edge over approximately 19 mm (3/4 inch) toward roof and down approximately 19 mm (3/4 inch) unless shown otherwise.
- E. Gutter Spacers:
1. Fabricate of same material and thickness as gutter.
  2. Fabricate 25 mm (one inch) wide strap and fasten to gutters not over 900 mm (36 inches) on center.
  3. Turn back edge up 25 mm (one inch) and lap front edge over gutter bead.
  4. Rivet and solder to gutter except rivet and seal to aluminum.
- F. Outlet Tubes:
1. Form outlet tubes to connect gutters to conductors of same metal and thickness as gutters extend into the conductor 75 mm (3 inch). Flange upper end of outlet tube 13 mm (1/2 inch).
  2. Lock and solder longitudinal seam except use sealant in lieu of solder with aluminum.
  3. Solder tube to gutter. Seal aluminum tube to gutter and rivet to gutter.
  4. Fabricate basket strainers of same material as gutters.
- G. Gutter Brackets:
1. Fabricate of same metal as gutter. Use the following:
    - a. 5 by 25 mm (3/16 by 1 inch) or a dimension approved by the COTR.
  2. Fabricate to gutter profile.
  3. Drill two 5 mm (3/16 inch) diameter holes in anchor leg for countersunk flat head screws.

## **2.10 CONDUCTORS (DOWNSPOUTS)**

- A. Fabricate conductors of same metal and thickness as gutters in sections approximately 3000 mm (10 feet) long with 19 mm (3/4 inch) wide flat locked seams.
  - 1. Fabricate open face channel shape with hemmed longitudinal edges.
- B. Fabricate elbows by mitering, riveting, and soldering except seal aluminum in lieu of solder. Lap upper section to the inside of the lower piece.
- C. Fabricate conductor brackets or hangers of same material as conductor, 2 mm (1/16 inch) thick by 25 mm (one inch) minimum width. Form to support conductors 25 mm (one inch) from wall surface in accordance with Architectural Sheet Metal Manual Plate 34, Design C for rectangular shapes and E for round shapes.
- D. Conductor Heads:
  - 1. Fabricate of same material as conductor.
  - 2. Fabricate conductor heads to not less than 250 mm (10 inch) wide by 200 mm (8 inch) deep by 200 mm (8 inches) from front to back.
  - 3. Form front and side edges channel shape not less than 13 mm (1/2 inch) wide flanges with edge hemmed.
  - 4. Slope bottom to sleeve to conductor or downspout at not less than 60 degree angle.
  - 5. Extend wall edge not less than 25 mm (one inch) above front edge.
  - 6. Solder joints for water tight assembly.
  - 7. Fabricate outlet tube or sleeve at bottom not less than 50 mm (2 inches) long to insert into conductor.

## **2.11 SPLASHPANS**

- A. Fabricate splashpans from the following:
  - 1. 1.25 mm (0.050 inch) thick aluminum.
- B. Fabricate in accordance with Architectural Sheet Metal Manual Plate 35 with not less than two ribs as shown in alternate section.

## **2.12 REGLETS**

- A. Fabricate reglets of one of the following materials:
  - 1. 0.4 Kg (16 ounce) copper.
  - 2. Stainless steel, not less than 0.3 mm (0.012 inch) thick.

3. Plastic coated extruded aluminum, not less than 1.4 mm (0.055 inch) thick prefilled with butyl rubber sealer and complete with plastic wedges inserted at 1000 mm (40 inches) on centers.
4. Plastic, ASTM D1784, Type II, not less than 2 mm (0.075 inch) thick.
- B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.
- C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the concrete.
- D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.
- E. Fabricate mitered corners, fittings, and special shapes as may be required by details.
- F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

### **2.13 SCUPPERS**

- A. Fabricate scuppers with minimum of 100 mm (4 inch) wide flange.
- B. Provide flange at top on through wall scupper to extend to top of base flashing.
- C. Fabricate exterior wall side to project not less than 13 mm (1/2 inch) beyond face of wall with drip at bottom outlet edge.
- D. Fabricate not less than 100 mm (4 inch) wide flange to lap behind gravel stop fascia.
- E. Fabricate exterior wall flange for through wall scupper not less than 25 mm (one inch) wide on top and sides with edges hemmed.
- F. Fabricate gravel stop bar of 25 mm x 25 mm (one by one inch) angle strip soldered to bottom of scupper.
- G. Fabricate scupper not less than 200 mm (8 inch) wide and not less than 125 mm (5 inch) high for through wall scupper.
- H. Solder joints watertight.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General:
  1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc.,

publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.

2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.
8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.

14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
  - a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
  - b. Paint dissimilar metal with a coat of bituminous paint.
  - c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
  - a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
  - b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

### **3.2 THROUGH-WALL FLASHING**

#### **A. General:**

1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of concrete floors; and elsewhere as shown.
2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches) and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
7. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.

8. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
9. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
10. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
11. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
12. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
13. Continue flashing around columns:
  - a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
  - b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).
- B. Flashing at Top of Concrete Foundation Walls Where concrete is exposed. Turn up not less than 200 mm (8 inch) high and into masonry backup mortar joint or reglet in concrete backup as specified.
- C. Flashing at Top of Concrete Floors (except where shelf angles occur): Place flashing in horizontal masonry joint not less than 200 mm (8 inch) below floor slab and extend into backup masonry joint at floor slab 38 mm (1 1/2 inch).
- D. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint.
- E. Flashing at Veneer Walls:
  1. Install near line of finish floors over shelf angles or where shown.
  2. Turn up against sheathing.
  3. At stud framing, hem top edge 19 mm (3/4 inch) and secure to each stud with stainless steel fasteners through sheathing.
  4. At concrete backing, extend flashing into reglet as specified.

5. Coordinate with installation of waterproofing or asphalt felt for lap over top of flashing.

F. Lintel Flashing when not part of shelf angle flashing:

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

G. Window Sill Flashing:

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

### **3.3 BASE FLASHING**

A. Install where roof membrane type base flashing is not used and where shown.

1. Install flashing at intersections of roofs with vertical surfaces or at penetrations through roofs, to provide watertight construction.
2. Install metal flashings and accessories having flanges extending out on top of the built-up roofing before final bituminous coat and roof aggregate is applied.
3. Set flanges in heavy trowel coat of roof cement and nail through flanges into wood nailers over bituminous roofing.
4. Secure flange by nailing through roofing into wood blocking with nails spaced 75 mm (3 inch) on centers or, when flange over 100 mm (4 inch) wide terminate in a 13 mm (1/2 inch) folded edge anchored with cleats spaced 200 mm (8 inch) on center. Secure one end of cleat over nail heads. Lock other end into the seam.

B. For long runs of base flashings install in lengths of not less than 2400 mm (8 feet) nor more than 3000 mm (ten feet). Install a 75 mm (3 inch) wide slip type, loose lock expansion joint filled with sealant in joints of base flashing sections over 2400 mm (8 feet) in length. Lock and solder corner joints at corners.

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



### 3.4 COUNTERFLASHING (CAP FLASHING OR HOODS)

#### A. General:

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

#### B. One Piece Counterflashing:

1. Where flashing is installed at new masonry, coordinate to insure proper height, embed in mortar, and end lap.
2. Where flashing is installed in reglet in concrete insert upper edge into reglet. Hold flashing in place with lead wedges spaced not more than 200 mm (8 inch) apart. Fill joint with sealant.
3. Where flashing is surface mounted on flat surfaces.
  - a. When top edge is double folded anchor flat portion below sealant "V" joint with fasteners spaced not over 400 mm (16 inch) on center:
    - 1) Locate fasteners in masonry mortar joints.
    - 2) Use screws to sheet metal or wood.
  - b. Fill joint at top with sealant.
4. Where flashing or hood is mounted on pipe.
  - a. Secure with draw band tight against pipe.
  - b. Set hood and secure to pipe with a one by 25 mm x 3 mm (1 x 1/8 inch) bolt on stainless steel draw band type clamp, or a stainless worm gear type clamp.
  - c. Completely fill joint at top with sealant.

#### C. Two-Piece Counterflashing:

1. Where receiver is installed at new masonry coordinate to insure proper height, embed in mortar, and lap.
2. Surface applied type receiver:

- a. Secure to face construction in accordance, with manufacturers instructions.
  - b. Completely fill space at the top edge of receiver with sealant.
- 3. Insert counter flashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.
- D. Where vented edge occur install so lower edge of counterflashing is against base flashing.
- E. When counter flashing is a component of other flashing install as shown.

### **3.5 REGLETS**

- A. Install reglets in a manner to provide a watertight installation.
- B. Locate reglets not less than 225 mm (9 inch) nor more than 400 mm (16 inch) above roofing, and not less than 125 mm (5 inch) nor more than 325 mm (13 inch) above cant strip.
- C. Butt and align end joints on each section of reglet and securely hold in position until concrete or mortar are hardened:
  - 1. Coordinate reglets for anchorage into concrete with formwork construction.
  - 2. Coordinate reglets for masonry to locate horizontally into mortar joints.

### **3.6 HANGING GUTTERS**

- A. Hang gutters with high points equidistant from downspouts. Slope at not less than 1:200 (1/16 inch per foot).
- B. Lap joints, except for expansion joints, at least 25 mm (one inch) in the direction of flow. Rivet and seal or solder lapped joints.
- C. Support gutters in brackets spaced not more than 600 mm (24 inch) on centers, brackets attached to facial or wood nailer by at least two screws or nails.
  - 1. For copper or copper clad stainless steel gutters use brass or bronze brackets.
  - 2. For stainless steel gutters use stainless steel brackets.
  - 3. For aluminum gutters use aluminum brackets or stainless steel brackets.
  - 4. Use brass or stainless steel screws.
- D. Secure brackets to gutters in such a manner as to allow free movement of gutter due to expansion and contraction.
- E. Gutter Expansion Joint:

1. Locate expansion joints midway between outlet tubes.
  2. Provide at least a 25 mm (one inch) expansion joint space between end baffles of gutters.
  3. Install a cover plate over the space at expansion joint.
  4. Fasten cover plates to gutter section on one side of expansion joint only.
  5. Secure loose end of cover plate to gutter section on other side of expansion joint by a loose-locked slip joint.
- F. Outlet Tubes: Set bracket strainers loosely into gutter outlet tubes.

### **3.7 CONDUCTORS (DOWNSPOUTS)**

- A. Where scuppers discharge into downspouts install conductor head to receive discharge with back edge up behind drip edge of scupper. Fasten and seal joint. Sleeve conductors to gutter outlet tubes and fasten joint and joints between sections.
- B. Set conductors plumb and clear of wall, and anchor to wall with two anchor straps, located near top and bottom of each section of conductor. Strap at top shall be fixed to downspout, intermediate straps and strap at bottom shall be slotted to allow not less than 13 mm (1/2 inch) movement for each 3000 mm (10 feet) of downspout.
- C. Install elbows, offsets and shoes where shown and required. Slope not less than 45 degrees.

### **3.8 SPLASH PANS**

- A. Install where downspouts discharge on low slope roofs unless shown otherwise.
- B. Set in roof cement prior to pour coat installation or sealant compatible with single ply roofing membrane.

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**SECTION 07 61 16**  
**SNAP-ON BATTEN STANDING SEAM SHEET METAL ROOFING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies the installation of snap-on batten standing seam roofing and snow guards.

**1.2 RELATED WORK**

- A. Sealant: Section 07 92 00, JOINT SEALANTS.
- B. Metal Deck Substrate: Section 05 31 00, STEEL DECKING.
- C. EPDM Roof Flashings: Section 07 53 23, EPDM ROOFING.
- D. Flashing Intersection with EIFS Wall System: 07 24 00, EXTERIOR INSULATION AND FINISH SYSTEM.

**1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's product data and installation Instructions for all system products.
- B. Shop Drawings: Submit installation shop drawings for standing seam metal roof, including all edge and flashing conditions.

**1.4 INSTALLATION REQUIREMENTS**

Install in accordance with SMACNA Architectural Sheet Metal Manual except as otherwise shown or specified.

**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):
  - B32-04.....Solder Metal
  - B152-06.....Copper Sheet, Strip, Plate, and Rolled Bar
  - C171-03.....Sheet Materials for Curing Concrete
  - D226-06.....Asphalt-Saturated Organic Felt Used In Roofing and Waterproofing
  - D227-03.....Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing
  - D2822-05.....Asphalt Roofing Cement
  - F1667-05.....Driven Fasteners: Nails, Spikes and Staples
- C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual (Sixth Edition - 1993)

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Basis-of-Design Product: Firestone Building Products, Indianapolis, IN, UNA-CLAD, UC-1 Snap-On Standing Seam Roof Panel; or, COTR-approved equal. Seam spacing at 16" o.c., with 1.75" high standing seam.
- B. Zaleski Snow-Guards for Roofs, Inc., Model No. 9 (0.020 inch-thick, Stainless Steel, formed to double thickness) or COTR's approved equal.

### **2.2 HOT-DIPPED GALVANIZED OR GALVALUME**

ASTM A446-85 Grade C G90 coating A525-86 24 gauge core steel or prefinished Galvalume - ASTM A792-86 AZ-55. Finish shall be full strength Kynar 500 Fluoropolymer coating, applied by the manufacturer on a continuous coil line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil.

### **2.3 FASTENERS**

Galvanized steel with washers where required.

### **2.4 SEALANT**

As specified in Section 79 92 00.

### **2.5 ROOFING FELT**

#30 unperforated asphalt saturated roofing felt underlayment.

### **2.6 FABRICATION**

All exposed adjacent flashing shall be of same material and finish as the roof panels. Hem all exposed edges of flashing on underside, 1/2 inch.

### **2.7 STANDING SEAM PANEL**

Panels shall be 1-1/2" high vertical legs, spaced 16-1/2" on center and shall have no exposed fasteners. Standing seam shall be of an interlocking, "snap-lock" design.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Follow SMACNA manual except as otherwise specified here.
- B. Coordinate flashing and roof intersection work with that of EIFS contractor and the EPDM roofing contractor.
- C. Roofing surface:
  - 1. Clean and dry before application.

2. Cover plywood surface with roofing felt and a layer of building paper with seams lapped 50 mm (two inches).
- D. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.
- E. Install starter and edge trim before installing roof panels.
- F. Remove protective strippable film prior to installation of roof panels.
- G. At eaves and rakes which do not abut vertical surfaces, turn roofing sheets over edge of roof sheathing and hook 19 mm (3/4-inch) over a 560 g (20 ounce) cold rolled copper edge strip. Form edge strip from 2440 to 3000 mm (8 to 10 foot) long pieces with ends butted together. Secure edge strip to roof deck with nails 100 mm (4 inches) on center. Face nailing of roofing will not be permitted. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
- H. Install stainless steel snow-guards using sealant adhesive or double-sided tape, in a pattern as recommended by snow-guard manufacturer. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of snow-guards. For snow-guards installed with sealant adhesive, verify forecasted temperature will be above 20 degrees F or 48 hours after installation; for snow-guards installed with 2-sided tape, verify forecasted temperature will be above 32 degrees F for 2 days and nights after installation.
- I. Install sealants for preformed roofing panels as approved on shop drawings.
- J. Do not allow panels to come in contact with dissimilar metals.

### **3.2 CLEANING**

- A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.
- B. Remove all scrap and construction debris from the site.

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**SECTION 07 71 00  
ROOF SPECIALTIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies roof hatches

**1.2 RELATED WORK**

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

**1.3 QUALITY CONTROL**

- A. Roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.
- B. Accessory shall be completely assembled to the greatest extent possible before delivery to the site.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- C. Manufacturer's Literature and Data: Each item specified.

**1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):  
RR-G-1602D.....Grating, Metal, Other Than Bar Type (Floor,  
Except for Naval Vessels)
- C. American Society for Testing and Material (ASTM):  
A653/A653M-02.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-  
Iron Alloy-Coated (Galvannealed) By the Hot-Dip  
Process  
B209/209M-02.....Aluminum and Aluminum Alloy-Sheet and Plate  
B221/221M-02.....Aluminum-Alloy Extruded Bars, Rods, Wire,  
Shapes, and Tubes  
C612-00.....Mineral Fiber Block and Board Thermal Insulation  
D1187-97.....Asphalt-Base Emulsions for Use as Protective  
Coatings for Metal

- D. National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500 Series.....Metal Finishes Manual
- E. American Architectural Manufacturers Association (AAMA):  
605-98.....High Performance Organic Coatings on  
Architectural Extrusions and Panels.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Aluminum, Extruded: ASTM B221/B221M.
- B. Aluminum Sheet: ASTM B209/B209M.
- C. Galvanized Sheet Steel: ASTM A526/A526M; G-90 coating.
- D. Metal Grating for Roof Walkway: Fed. Spec. RR-G-1602.

### **2.2 ROOF HATCH (SCUTTLE)**

- A. Fabricate from aluminum with mill finish.
- B. Curb and Cover:
  - 1. Exterior facing: Minimum 2.3 mm (0.09 inch) thick sheet aluminum.
  - 2. Interior facing: Minimum 1 mm (0.04 inch) thick sheet aluminum.
  - 3. Minimum of 25 mm (one inch) thick mineral fiber insulation between facings of cover and over exterior face of curb.
  - 4. Form exterior curb facing with an integral three inch wide roof flange and cap flashing minimum 2.3 mm (0.09 inch) thick sheet aluminum.
  - 5. Make curb 300 mm (12 inches).
  - 6. Form cover to lap curb and cap flashing.
  - 7. Size opening as shown.
- C. Hardware:
  - 1. Provide spring snap latch with inside and outside operating handles and padlock hasp on inside. Provide two snap latches when hinge side is over 2100 mm (7 feet) long.
  - 2. Provide pintle hinges.
  - 3. Provide automatic hold open and operating arm with enclosed torsion or compression spring lifting mechanism.
  - 4. Covers shall automatically lock in the open position at not less than 70 degrees.
  - 5. Provide weatherstripping at cover closure.
  - 6. Galvanize all hardware items.
- D. Assembly:
  - 1. Completely shop assemble roof scuttle.
  - 2. Fully weld all joints exposed to the weather and built into the roofing.



3. Finish weld smooth where exposed.
4. Operation with minimum force to open and close.

## **2.3 FINISH**

- A. In accordance with NAAMM Amp 500 Series.
- B. Aluminum, Mill Finish: AA-MIX, as fabricated.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install roof specialties where shown.
- B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.
- C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.
- E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
  - a. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
  - b. Install expansion joint cover with 6 mm (1/4 inch) wide space at end joints and tension bars at 600 mm (24 inches) on center.
  - c. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 100 mm (4 inches).
- F. Equipment Supports: Do not anchor to insulating concrete or metal deck. Anchor only to building structure as per manufacturers recommendations.

### **3.2 PROTECTION OF ALUMINUM**

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.
- B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

### **3.3 ADJUSTING**

- A. Adjust roof hatch hardware to operate freely and so that cover will operate without binding, close tightly at perimeter, and latch securely.

#### **3.4 PROTECTION**

Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

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**SECTION 07 72 00**  
**ROOF ACCESSORIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies copings, gravel stops, fascias, and expansion-joints.

**1.2 RELATED WORK**

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

**1.3 QUALITY CONTROL**

- A. All roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.
- B. Each accessory type shall be the same and be made by the same manufacturer.
- C. Each accessory shall be completely assembled to the greatest extent possible before delivery to the site.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples: Representative sample panel of color anodized aluminum not less than 100 mm X 100 mm (four by four inches), except extrusions shall be a width not less than section to be used. Sample shall show coating with integral color and texture and shall include manufacturer's identifying label.
- C. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- D. Manufacturer's Literature and Data: Each item specified.
- E. Certificates: Stating that aluminum has been given specified thickness of anodizing.

**1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Material (ASTM):  
B209/209M-07.....Aluminum and Aluminum Alloy-Sheet and Plate

- B221/221M-07.....Aluminum-Alloy Extruded Bars, Rods, Wire,  
Shapes, and Tubes
- C612-04.....Mineral Fiber Block and Board Thermal Insulation
- D1187-97 (R2002).....Asphalt-Base Emulsions for Use as Protective  
Coatings for Metal
- C. National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500-505-88.....Metal Finishes Manual
- D. American Architectural Manufacturers Association (AAMA):  
605-98.....High Performance Organic Coatings on  
Architectural Extrusions and Panels.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Aluminum, Extruded: ASTM B221/B221M.
- B. Aluminum Sheet: ASTM B209/B209M.
- C. Galvanized Sheet Steel: ASTM A526/A526M; G-90 coating.
- D. Insulation: ASTM C612, Class 1 or 2.

### **2.2 COPINGS**

- A. Fabricate of aluminum not less than (0.063)
- B. Turn outer edges down each face of wall as shown.
- C. Maximum lengths of 3000 mm (10 feet).
- D. Shop fabricate external and internal corners as one piece assemblies  
with not less than 300 mm (12 inch) leg lengths.
- E. Copings shall be Category 5 FM rated
- F. Provide 100 mm (four inch) wide 0.8 mm (0.032 inch) thick watertight  
joint covers.
- G. Provide anchor gutter bar of 0.8 mm (0.032 inch) thick with anchor holes  
formed for underside of joint.
- H. Provide concealed guttered splice plate of 0.8 mm (0.032 inch) thick  
with butyl or other resilient seal strips anchored to splice plate for  
underside of joint. Use galvanized steel anchor plate providing  
compression spring anchoring of coping cover.
- I. Finish: Fluorocarbon as specified.

### **2.3 EXTRUDED ALUMINUM GRAVEL STOPS AND FASCIAS**

- A. Fabricate of aluminum not less than 2 mm (0.078 inch) thick.
- B. Turn fascia down face of wall and up above roof as shown.
- C. Maximum lengths of 3000 mm (10-feet).

- D. Shop fabricate external and internal corners as one piece assemblies with not less than 300 mm (12 inch) leg lengths.
- E. Provide 100 mm (four inch) wide 2 mm (0.078 inch) thick watertight joint covers with 150 mm (six inch) wide 0.8 mm (0.030 inch) thick underside joint flashing.

#### **2.4 EXTRUDED ALUMINUM FASCIA-CANT SYSTEM**

- A. The fascia-cant system consists of three pieces, an extruded aluminum fascia, a galvanized steel cant, and an aluminum compression clamp.
- B. Furnish in stock lengths of not more than 3000 mm (10 feet) long.
- C. Form fascia from not less than 2 mm (0.070 inch) thick aluminum. Provide four inch wide 0.8 mm (0.032-inch) thick concealed sheet aluminum joint cover plates in back of fascia.
- D. Form cant strip from galvanized steel not less than 0.8 mm (0.0299 inch) thick, to profile shown and design to hold lower edge of the fascia.
- E. Form compression clamp of not less than 0.8 mm (0.032 inch) thick aluminum designed to hold the top edge of the fascia and the built-up flashing.
- F. Internal and external corners:
  - 1. Factory fabricate and fully weld mitered joints.
  - 2. Furnish corner sections in manufacturers standard sizes shown with not less than 300 mm (12 inch) leg lengths.
- G. Factory fabricated fascia sump assemblies.
  - 1. Fabricate sump assemblies with stainless steel cores and extruded aluminum cover to match fascia-cant.
  - 2. Provide stainless steel outlet, tube sized to suit downspout and solder to core to make watertight.
  - 3. Furnish sump assembly in 500 mm (20 inch) minimum lengths.
- H. Factory fabricated scupper assemblies:
  - 1. Fabricate scupper assembly with extended plates to match fascia-cant in 500 mm (20 inch) minimum lengths.
  - 2. Extend outlet opening not less than 50 mm (two inches) with drip edge.
  - 3. Fabricate with stainless steel cores or sleeve to drain water from toe of cant and flash in to built-up roofing with 100 mm (4 inch) wide flange.
- I. Finish on aluminum: fluorocarbon as specified.

## **2.5 EXTRUDED ALUMINUM ROOF EXPANSION JOINT COVERS**

- A. Fabricate in 3000 mm (10 foot) lengths with fastener openings slotting for expansion not over 600 mm (24 inch) centers.
- B. Provide four-way expansion, for joint widths shown.
- C. Mill finish on aluminum.
- D. Form waterstop or moisture seals of continuous sheets of neoprene, not less than 0.8 mm (0.032 inch) thick.
- E. Fabricate corners as one piece assembly with mitered and welded joint and least dimension legs not less than 300 mm (12 inches) long.
- F. Factory fabricate end caps and transitions to insure waterproof assembly.
- G. Two piece assembly:
  - 1. Roof expansion joint system consists of an extruded aluminum cover combination extruded aluminum frame or curb with integral adjustable counter flashing flange, and moisture seals.
  - 2. Form cover from extruded aluminum 2 mm (0.078 inch) minimum thickness.
  - 3. Provide compression gasket separating cover from curb at bearing.

## **2.6 FINISH**

- A. In accordance with NAAMM Amp 500-505.
- B. Aluminum, Mill Finish: AA-MIX, as fabricated.
- C. Aluminum, Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1, Architectural, 0.7 mils thick. Class II, Architectural, 0.4 mils thick.
- D. Fluorocarbon Finish: AAMA 605.2 high performance organic coating.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install roof accessories where shown.
- B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.
- C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.
- E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
- F. Gravel Stops and Fascias:

1. Install gravel stops and fascia with butt joints with approximately 6 mm (1/4 inch) space for expansion.
2. Over each joint provide cover plates of sheet aluminum, complete with concealed sheet aluminum flashing, centered under each joint.
3. Lap cover plates and concealed flashing over the gravel stop and fascia not less than four inches.
4. Extend concealed flashing over built-up roofing, embed in roof cement and turn down over face of blocking at roof edge.

G. Aluminum Coping:

1. Install sections of coping with approximately 6 mm (1/4-inch) space between ends of sections.
2. Center joint gutter bar and covers at joints and securely lock in place.
3. When snap-on system is used insure front and back edges are locked in place.

H. Fascia-Cant System:

1. Install galvanized steel cant; coordinate with roofing work and after completion of roofing work install extruded aluminum fascia, concealed joint cover plate, and aluminum compression clamp, where shown.
2. Install system to allow for expansion and contraction with 6 mm (1/4 inch) space between extruded aluminum members and galvanized steel cant as required by manufacturer of system.
3. Offset joints in extruded aluminum members from galvanized steel cant joints.

I. Expansion Joint Covers:

1. Install to terminate base flashing 200 mm (8 inches) above roof.
2. Install moisture seals to drain water to outlets that do not permit water to enter buildings construction.
3. Use stainless steel screws when exposed.
4. Three piece assembly:
  - a. Install curb section with screws to wood blocking, allowing 6 mm (1/4 inch) at butt joints between sections with splice plate at joint.
  - b. Install cant to wood blocking by nailing along horizontal flange every 150 mm (6 inches), with galvanized roofing nails 25 mm (one inch) long.
  - c. After completion of base flashing install cap flashing and compression clamp and fasten to the curb or metal cant with

stainless steel self-tapping screws with neoprene washers under head spaced approximately 450 mm (18 inches) on center.

- d. Install expansion joint cover with a 6 mm (1/4 inch) wide end joints.
  - e. Install over end joint a cover plate complete with concealed aluminum flashing, centered under each joint. Fabricate flashing to lap cover not less than four inches.
5. Two piece assembly:
- a. Install curb section with screws allowing 6 mm (1/4 inch) space at end joints with splice plate at joint.
  - b. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
  - c. Install expansion joint cover with 6 mm (1/4 inch) wide space at end joints and tension bars at 600 mm (24 inches) on center.
  - d. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 100 mm (4 inches).

### **3.2 PROTECTION OF ALUMINUM**

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.
- B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

### **3.3 ADJUSTING**

Adjust expansion joints to close tightly and be watertight; insuring maximum allowance for building movement.

### **3.4 PROTECTION**

Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

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**SECTION 07 81 00**  
**APPLIED FIREPROOFING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Manufacturer's complete and detailed application instructions and specifications.
  - 2. Manufacturer's repair and patching instructions.
- C. Certificates:
  - 1. Certificate from testing laboratory attesting fireproofing material and application method meet the specified fire ratings.
    - a. List thickness and density of material required to meet fire ratings.
    - b. Accompanied by complete test report and test record.
  - 2. Manufacturer's certificate indicating sprayed-on fireproofing material supplied under the Contract is same within manufacturing tolerance as fireproofing material tested.
- D. Miscellaneous:
  - 1. Manufacturer's written approval of surfaces to receive sprayed-on fireproofing.
  - 2. Manufacturer's written approval of completed installation.
  - 3. Manufacturer's written approval of the applicators of fireproofing material.

**1.3 PRODUCT DELIVERY, STORAGE AND HANDLING**

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

- E. Remove materials that have been exposed to water before installation from the site.

#### **1.4 QUALITY CONTROL**

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

#### **1.5 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):
  - C841-03.....Installation of Interior Lathing and Furring
  - C847-06.....Metal Lath
  - E84-08.....Surface Burning Characteristics of Building Materials
  - E119-08.....Fire Tests of Building Construction and Materials

- E605-93 (R2006).....Thickness and Density of Sprayed Fire-Resistive  
Materials Applied to Structural Members
- E736-00.....Cohesion/Adhesion of Sprayed Fire-Resistive  
Materials Applied to Structural Members
- E759-92 (R2005).....The Effect of Deflection on Sprayed Fire-  
Resistive Material Applied to Structural  
Members
- E760-92 (R2005).....Impact on Bonding of Sprayed Fire-Resistive  
Material Applied to Structural Members
- E761-92 (R2005).....Compressive Strength of Fire-Resistive Material  
Applied to Structural Members
- E859-93 (R2006).....Air Erosion of Sprayed Fire-Resistive Materials  
Applied to Structural Members
- E937-93 (R2005).....Corrosion of Steel by Sprayed Fire-Resistive  
Material Applied to Structural Members
- E1042-02.....Acoustically, Absorptive Materials Applied by  
Trowel or Spray.
- G21-96 (R2002).....Determining Resistance of Synthetic Polymeric  
Materials to Fungi
- C. Underwriters Laboratories, Inc. (UL):  
Fire Resistance Directory...Latest Edition including Supplements
- D. Warnock Hersey (WH):  
Certification Listings..Latest Edition
- E. Factory Mutual System (FM):  
Approval Guide.....Latest Edition including Supplements

## **PART 2 - PRODUCTS**

### **2.1 SPRAYED-ON FIREPROOFING**

- A. ASTM E1042, Class (a), Category A.
  - 1. Type I, factory mixed cementitious materials with approved aggregate. Use in areas that are exposed.
  - 2. Type II, factory mixed mineral fiber with integral inorganic binders minimum 240 kg/m<sup>3</sup> (15 lb/ft<sup>3</sup>) density per ASTM E605 test unless specified otherwise. Use in areas that are completely encased.
- B. Materials containing asbestos are not permitted.
- C. Fireproofing characteristics when applied in the thickness and density required to achieve the fire-rating specified.

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

## 2.2 ADHESIVE

- A. Bonding adhesive for Type II (fibrous) materials as recommended and supplied by the fireproofing material manufacturer.
- B. Adhesive may be an integral part of the material or applied separately to surface receiving fireproofing material.

## 2.3 SEALER

- A. Sealer for Type II (fibrous) material as recommended and supplied by the fireproofing material manufacturer.
- B. Surface burning characteristics as specified for fireproofing material.
- C. Fungus resistant.
- D. Sealer may be an integral part of the material or applied separately to the exposed surface. When applied separately use contrasting color pigmented sealer, white preferred.

## 2.4 WATER

- A. Clean, fresh, and free from organic and mineral impurities.

B. pH of 6.9 to 7.1.

## **2.5 MECHANICAL BOND MATERIAL**

A. Expanded Metal Lath: ASTM C847, minimum weight of 0.92 kg/m<sup>2</sup> (1.7 pounds per square yard).

B. Fasteners: ASTM C841.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 APPLICATION**

- A. Do not start application until written approval has been obtained from manufacturer of fireproofing materials that surfaces have been inspected by the manufacturer or his representative, and are suitable to receive sprayed-on fireproofing.
- B. Coordinate application of fireproofing material with other trades.
- C. Application of Metal Lath:
  - 1. Apply to beam and columns having painted surfaces which fail ASTM E736 Bond Test requirements in pre-application test area.
  - 2. Apply to beam flanges 300 mm (12-inches) or more in width.
  - 3. Apply to column flanges 400 mm (16-inches) or more in width.
  - 4. Apply to beam or column web 400 mm (16-inches) or more in depth.
  - 5. Tack weld or mechanically fasten on maximum of 300 mm (12-inch) center.
  - 6. See design criteria section of the approved assemblies used.
  - 7. Lap and tie lath member in accordance with ASTM C841.
- D. Mix and apply in accordance with manufacturer's instructions.
  - 1. Mechanically control material and water ratios.

2. Apply adhesive and sealer, when not an integral part of the materials, in accordance with the manufacturer's instructions.
3. Apply to density and thickness indicated in UL Fire Resistance Directory, FM Approval Guide, or WH Certification Listings unless specified otherwise. Test in accordance with ASTM E119.
4. Minimum applied dry density per cubic meter (cubic foot) for the underside of the walk on deck (interstitial) hung purl in or beam and steel deck, columns in interstitial spaces and mechanical equipment rooms shall be as follows:
  - a. Type II -  $350 \text{ kg/m}^3$  ( $22 \text{ lb/ft}^3$ ).
- E. Application shall be completed in one area, inspected and approved by COTR before removal of application equipment and proceeding with further work.

### **3.3 FIELD TESTS**

- A. Tests of applied material will be performed by VA retained Testing Laboratory. See Section 01 45 29, TESTING LABORATORY SERVICES.
- B. COTR will select area to be tested in specific bays on each floor using a geometric grid pattern.
- C. Test for thickness and density in accordance with ASTM E605. Areas showing thickness less than that required as a result of fire endurance test will be rejected.
- D. Areas showing less than required fireproofing characteristics will be rejected on the following field tests.
  1. Test for cohesion/adhesion: ASTM E736.
  2. Test for bond impact strength: ASTM E760.

### **3.4 PATCHING AND REPAIRING**

- A. Inspect after mechanical, electrical and other trades have completed work in contact with fireproofing material, but before sprayed material is covered by subsequent construction.
- B. Perform corrective measures in accordance with fireproofing material Manufacturer's recommendations.
  1. Respray areas requiring additional fireproofing material to provide the required thickness, and replace dislodged or removed material.
  2. Spray material for patching by machine directly on point to be patched, or into a container and then hand apply.
  3. Hand mixing of material is not permitted.

C. Repair:

1. Respray all test and rejected areas.
2. Patch fireproofing material which is removed or disturbed after approval.

D. Perform final inspection of sprayed areas after patching and repair.

**3.5 SCHEDULE**

A. Apply fireproofing material in interior structural steel members and on underside of interior steel floor and roof decks, except on following surfaces:

1. Structural steel and underside of steel decks in elevator machine rooms.
2. Steel members in elevator hoist ways.
3. Steel to be encased in concrete or designated to receive other type of fireproofing.

B. Type II:

1. One hour fire rating. Refer to Life Safety drawing for locations of fire-rated structure.
  - a. UL Design No. P733 for roof area structural steel and roof metal deck.
  - b. UL design No. G709 for second floor framing - structural steel and floor metal deck.

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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 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

**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):
  - E84-07.....Surface Burning Characteristics of Building Materials
  - E814-06.....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
  - 1479-03.....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 COTR.
- C. Clean up spills of liquid type materials.

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**SECTION 07 92 00**  
**JOINT SEALANTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

Section covers all sealant and caulking materials and their application, wherever required for complete installation of building materials or systems.

**1.2 RELATED WORK:**

- A. Sealing of site work concrete paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- B. Masonry control and expansion joint: Section 04 20 00, UNIT MASONRY.
- C. Firestopping penetrations: Section 07 84 00, FIRESTOPPING.
- D. Glazing: Section 08 80 00, GLAZING.
- E. Sound rated gypsum partitions/sound sealants: Section 09 29 00, GYPSUM BOARD.
- F. Mechanical Work: Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSION Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.

**1.3 QUALITY CONTROL:**

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
  - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
  - 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.

4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.

#### **1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.
- D. Manufacturer's Literature and Data:
  1. Caulking compound
  2. Primers
  3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

#### **1.5 PROJECT CONDITIONS:**

- A. Environmental Limitations:
  1. Do not proceed with installation of joint sealants under following conditions:
    - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 °C (40 °F).
    - b. When joint substrates are wet.
- B. Joint-Width Conditions:
  1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions:
  1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

#### **1.6 DELIVERY, HANDLING, AND STORAGE:**

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.

- C. Do not subject to sustained temperatures exceeding 5° C (40° F) or less than 32° C (90° F).

#### **1.7 DEFINITIONS:**

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Back-up Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

#### **1.8 WARRANTY:**

Warranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Warranty of Construction", FAR clause 52.246-21.

#### **1.9 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - C509-06.....Elastomeric Cellular Preformed Gasket and Sealing Material.
  - C612-04.....Mineral Fiber Block and Board Thermal Insulation.
  - C717-07.....Standard Terminology of Building Seals and Sealants.
  - C834-05.....Latex Sealants.
  - C919-02.....Use of Sealants in Acoustical Applications.
  - C920-05.....Elastomeric Joint Sealants.
  - C1021-08.....Laboratories Engaged in Testing of Building Sealants.
  - C1193-05.....Standard Guide for Use of Joint Sealants.
  - C1330-02 (R2007).....Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
  - D1056-07.....Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.
  - E84-08.....Surface Burning Characteristics of Building Materials.
- C. Sealant, Waterproofing and Restoration Institute (SWRI).  
The Professionals' Guide

## **PART 2 - PRODUCTS**

### **2.1 SEALANTS:**

#### **A. S-1:**

1. ASTM C920, polyurethane or polysulfide.
2. Type M.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 20-40

#### **B. S-3:**

1. ASTM C920, polyurethane or polysulfide.
2. Type S.
3. Class 25, joint movement range of plus or minus 50 percent.
4. Grade NS.
5. Shore A hardness of 15-25.
6. Minimum elongation of 700 percent.

#### **C. S-4:**

1. ASTM C920 polyurethane or polysulfide.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-40.

#### **D. S-6:**

1. ASTM C920, silicone, neutral cure.
2. Type S.
3. Class: Joint movement range of plus 100 percent to minus 50 percent.
4. Grade NS.
5. Shore A hardness of 15-20.
6. Minimum elongation of 1200 percent.

#### **E. S-9:**

1. ASTM C920 silicone.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Non-yellowing, mildew resistant.

#### **F. S-11:**

1. ASTM C920 polyurethane.

2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 35 to 50.

G. S-12:

1. ASTM C920, polyurethane.
2. Type M/S.
3. Class 25, joint movement range of plus or minus 50 percent.
4. Grade P/NS.
5. Shore A hardness of 25 to 50.

**2.2 CAULKING COMPOUND:**

- A. C-1: ASTM C834, acrylic latex.
- B. C-2: One component acoustical caulking, non drying, non hardening, synthetic rubber.

**2.3 COLOR:**

- A. Sealants used with exposed masonry shall match color of mortar joints.
- B. Sealants used with unpainted concrete shall match color of adjacent concrete.
- C. Color of sealants for other locations shall be light gray or aluminum, unless specified otherwise.
- D. Caulking shall be light gray or white, unless specified otherwise.

**2.4 JOINT SEALANT BACKING:**

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
  1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32° C (minus 26° F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.



- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

#### **2.5 FILLER:**

- A. Mineral fiber board: ASTM C612, Class 1.
- B. Thickness same as joint width.
- C. Depth to fill void completely behind back-up rod.

#### **2.6 PRIMER:**

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

#### **2.7 CLEANERS-NON POUROUS SURFACES:**

Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

### **PART 3 - EXECUTION**

#### **3.1 INSPECTION:**

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

#### **3.2 PREPARATIONS:**

- A. Prepare joints in accordance with manufacturer's instructions and SWRI.
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
  - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
  - 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:

- a. Concrete.
  - b. Masonry.
  - c. Unglazed surfaces of ceramic tile.
- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
  - a. Metal.
  - b. Glass.
  - c. Porcelain enamel.
  - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
  - 1. Apply primer prior to installation of back-up rod or bond breaker tape.
  - 2. Use brush or other approved means that will reach all parts of joints.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

### **3.3 BACKING INSTALLATION:**

- A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
- D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.

- E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

### **3.4 SEALANT DEPTHS AND GEOMETRY:**

- A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.
- B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

### **3.5 INSTALLATION:**

- A. General:
  - 1. Apply sealants and caulking only when ambient temperature is between 5° C and 38° C (40° and 100° F).
  - 2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
  - 3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
  - 4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
  - 5. Avoid dropping or smearing compound on adjacent surfaces.
  - 6. Fill joints solidly with compound and finish compound smooth.
  - 7. Tool joints to concave surface unless shown or specified otherwise.
  - 8. Finish paving or floor joints flush unless joint is otherwise detailed.
  - 9. Apply compounds with nozzle size to fit joint width.
  - 10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.
- B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.
- C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.
  - 1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.

2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

### **3.6 FIELD QUALITY CONTROL:**

- A. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- B. Inspect tested joints and report on following:
  1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
  2. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
  3. Whether sealants filled joint cavities and are free from voids.
  4. Whether sealant dimensions and configurations comply with specified requirements.
- C. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- D. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- E. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements.

Retest failed applications until test results prove sealants comply with indicated requirements.

### **3.7 CLEANING:**

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.
- B. After filling and finishing joints, remove masking tape.
- C. Leave adjacent surfaces in a clean and unstained condition.

### **3.8 LOCATIONS:**

- A. Exterior Building Joints, Horizontal and Vertical:
  - 1. Metal to Masonry or Stone: Type S-1
  - 2. Masonry to Masonry or Stone: Type S-1
  - 3. Stone to Stone: Type S-1
  - 4. Cast Stone to Cast Stone: Type S-1
  - 5. Threshold Setting Bed: Type S-1, S-3, S-4
  - 6. Masonry Expansion and Control Joints: Type S-6
  - 7. EIFS: Type S-6
- B. Metal Reglets and Flashings:
  - 1. Flashings to Wall: Type S-6
  - 2. Metal to Metal: Type S-6
- C. Sanitary Joints:
  - 1. Walls to Plumbing Fixtures: Type S-9
  - 2. Counter Tops to Walls: Type S-9
  - 3. Pipe Penetrations: Type S-9
- D. Horizontal Traffic Joints:
  - 1. Concrete Paving, Unit Pavers: Type S-11 or S-12
- E. Interior Caulking:
  - 1. Typical Narrow Joint 6 mm, (1/4 inch) or less at Walls and Adjacent Components: Types C-1 and C-2.
  - 2. Perimeter of Doors, Windows, Access Panels which Adjoin Concrete or Masonry Surfaces: Types C-1 and C-2.
  - 3. Joints at Masonry Walls and Columns, Piers, Concrete Walls or Exterior Walls: Types C-1 and C-2.
  - 4. Exposed Isolation Joints at Top of Full Height Walls: Types C-1 and C-2.
  - 5. Concealed Acoustic Sealant Type S-4, C-1 and C-2.

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**SECTION 07 95 13**  
**EXPANSION JOINT COVER ASSEMBLIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Section specifies floor, wall, and ceiling, and exterior building expansion joint assemblies (other than roof expansion joint systems).
- B. Types of assemblies:
  - Preformed Elastomeric Sealant Joint - for interior joints
  - Preformed, Precompressed, Open-Cell, Polyurethane Foam - for exterior joints

**1.2 RELATED WORK**

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

**1.3 QUALITY ASSURANCE**

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

**1.4 DELIVERY STORAGE AND HANDLING**

- A. Take care in handling of materials so as not to injure finished surface and components.
- B. Store materials under cover in a dry and clean location off the ground.
- C. Remove materials which are damaged or otherwise not suitable for installation from job site and replace with acceptable materials.

**1.5 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:

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

#### **1.6 APPLICABLE PUBLICATIONS**

- A. Publications listed form part of this specification to extent referenced. Publications are referred to in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
- A36/A36M-05.....Structural Steel
- A167-99 (R2004).....Stainless and Heat-Resisting Chromium-Nickel  
Steel Plate, Sheet, and Strip
- A283/A283M-03.....Low and Intermediate Tensile Strength Carbon  
Steel Plates
- A786/A786M-05.....Rolled Steel Floor Plates
- B36/B36M-06.....Brass, Plate, Sheet, Strip, and Rolled Bar
- B121-01(R2006).....Leaded Brass Plate, Sheet, Strip and Rolled Bar
- B209M-06.....Aluminum and Aluminum-Alloy Sheet and Plate  
(Metric)

- B221M-06.....Aluminum and Aluminum-Alloy Extruded Bars,  
Rods, Wire, Shapes, and Tubes (Metric)
- B455-05.....Copper-Zinc Lead Alloy (Leaded Brass) Extruded  
Shapes
- C864-05.....Dense Elastomeric Compression Seal Gaskets,  
Setting Blocks, and Spacers
- C920-05.....Elastomeric Joint Sealants
- D1187-97 (R2002).....Asphalt Base Emulsions for Use as Protective  
Coatings for Metal
- D2287-96 (R2001).....Non-rigid Vinyl Chloride Polymer and Copolymer  
Molding and Extrusion Compounds
- E119-07.....Fire Tests of Building Construction and  
Materials
- E814-06.....Fire Tests of Through-Penetration Fire Stops
- C. Federal Specifications (Fed. Spec):  
TT-P-645B.....Primer, Paint, Zinc-Molybdate, Alkyd Type
- D. The National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500 Series.....Metal Finishes Manual.
- E. National Fire Protection Association (NFPA):  
251-05.....Tests of Fire Endurance of Building  
Construction and Materials
- F. Underwriters Laboratories Inc. (UL):  
263-03.....Fire Tests of Building Construction and  
Materials

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

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



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

D. Fire Barrier:

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

E. Zinc-Molybdate Primer: Fed. Spec. TT-P-645.

F. Accessories:

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

## **2.2 FABRICATION**

A. General:

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

E119 and E814, NFPA 251, or UL 263 including hose stream test at full-rated period.

- b. Fire rating: Not less than rating of adjacent floor or wall construction.

7. Fire Barrier Systems:

- a. Material to carry label of approved independent testing laboratory, and be subject to follow-up system for quality assurance.
- b. Include thermal insulation where necessary, in accordance with above tests, with factory cut miters and transitions.
- c. For joint widths up to and including 150 mm (six inches), supply barrier in lengths up to 15000 mm (50 feet) to eliminate field splicing.
- d. For joint widths of seven inches and wider, supply barrier 3000 mm (10-foot) modules with overlapping ends for field splicing.
- e. For joints within enclosed spaces such as chase walls, include 1 mm (0.032-inch) thick galvanized steel cover where conventional expansion joint cover is not used.

- 8. Seal Strip factory - formed and bonded to metal frames and anchor members.

- 9. Compression Seals: Prefabricate from thermoplastic rubber or dense neoprene to sizes and approximate profiles shown.

B. Floor-to-Floor Metal Plate Joints:

- 1. Frames on each side of joint designed to support cover plate of design shown. Basis-of-Design Product: Balco RDA-1; or, C/S equivalent; or, COTR approved equal.
  - a. Continuous frame designed to finish flush with adjacent floor of profile indicated with seating surface and raised floor rim to accommodate flooring.
  - b. Provide concealed bolt and steel anchors for embedment in concrete.
  - c. Designed for filler materials between raised rim of frame and edge of cover plate where shown.
  - d. Frame and cover plates of some metal where exposed.
    - 1) Design cover plates to support 180 Kg (400 lbs) per 0.3 square meters (1-square foot).
    - 2) Cover plates free of rattle due to traffic.

- 3) No gaps or budges occur on filler material during design movement of joint.

C. Floor-to-Wall Metal Plate Joints:

1. Provide one frame on floor side of joint only. Provide wall side frame where required by manufacturer's design. Basis-of-Design Product: Balco RDAL-1; or, C/S equivalent; or, COTR approved equal.
2. Angle Cover Plates: Provide angle cover plates for joints to wall with countersunk flat-head exposed fasteners for securing to wall unless shown otherwise.
3. Space fasteners as recommended by manufacturer.

D. Interior Wall Joint Cover Assemblies:

1. Surface Mounted Metal Cover Plates:
  - a. Concealed frame for fastening to wall on one sides of joint. Basis-of-Design Product: Balco 75FWG-1 (WD-1 at new to existing wall); or, C/S equivalent; or, COTR approved equal.
  - b. Extend cover to lap each side of joint and to permit free movement on one side.
  - c. Provide concealed attachment of cover t frame cover in close contact with adjacent finish wall surfaces.
  - d. Use angle cover plates at intersection of walls.
  - e. Use smooth surface cover plates matching floor plates.
  - f. Use expansion fire inserts in fire rated walls, rated same as hour rating of wall.

E. Exterior Wall Joint Assemblies (Preformed, Precompressed, Open-Cell, Polyurethane Foam)

1. Open-cell polyurethane foam impregnated with a water-based, stabilized, polymer-modified acrylic.
2. Preformed, pre-compressed, self-expanding, with silicone pre-coated surface.
3. Factory applied and cured silicone weathering facing.
4. Field applied silicone corner beads after installation of preformed material.
5. Basis-of-Design Product: Colorseal by Emseal; or, Illbruck Sealant Systems; or, COTR approved equal.
  - a. Provide factory heat welded transitions where directional changes occur to ensure a watertight system.

- b. Provide pantographic wind load supports, maximum 2400 mm (8 feet) on center to support seal systems of 300 mm (12-inches) and wider.

F. Ceiling and Soffit Assemblies:

1. Variable movement vinyl insert in metal frame on both sides of joint.
2. Designed for flush mounting with no exposed fasteners.
3. Vinyl insert semi rigid either flush face or accordion shape as showed to span joint width without sagging.
4. Basis-of-Design Products: Balco AV-1 and AVL-1; or, C/S equivalent; or, COTR approved equal.

## **2.3 METAL FINISHES**

A. General:

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

B. Aluminum Finishes:

1. Finish letters and numbers for anodized aluminum are in accordance with the NAAMM AMP 501, Aluminum Association's Designation System).
  - a. Clear anodized finish: AA-C22A41 Chemically etched medium matte, clear anodic coating, Class I Architectural, 0.7 - mil thick.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

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

### 3.3 INSTALLATION

- A. Install in accordance with manufacturers installation instructions unless specified otherwise.
- B. Provide anchorage devices and fasteners for securing expansion joint assemblies to in-place construction including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete. Provide metal fasteners of type and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.
- C. Perform cutting, drilling and fitting required for installation of expansion joint cover assemblies.
- D. Install joint cover assemblies in true alignment and proper relationship to expansion joint opening and adjoining finished surfaces measured from established lines and levels.
- E. Allow for thermal expansion and contraction of metal to avoid buckling.
- F. Set floor covers at elevations flush with adjacent finished floor materials unless shown otherwise.
- G. Material and method of grouting floor frames set in prepared recesses in accordance with manufacturer's instructions.
- H. Locate wall, ceiling and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with required accessories.
- I. Locate anchors at interval recommended by manufacturer, but not less than 75 mm (3-inches) from each ends, and, not more than 600 mm (24-inches) on centers.
- J. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints.
- K. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames or plates.
- L. Flush Metal Cover Plates:
  - 1. Secure flexible filler between frames so that it will compress and expand.
  - 2. Adhere flexible filler materials to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

M. Waterstops:

1. Install in conjunction with floor joints and where shown, run continuously to prevent water damage to finish spaces.
2. Provide seal with frame to prevent water leakage.
3. Provide outlet tubes from waterstops to drain to prevent damage to finish spaces.

N. Fire Barriers:

1. Install in compliance with tested assembly.
2. Install in floors and in fire rated walls.
3. Use fire barrier sealant or caulk supplied with system.

O. Sealants:

Install to prevent water and air infiltration.

P. Vertical Exterior Extruded Thermoplastic Rubber.

1. Install side frames mounted on sealant or butyl caulk tape with appropriate anchors 600 mm (24 inches) on center complete with independent continuous PVC back seal.
2. Install primary seals retained in extruded aluminum side frames.

Q. Installation of Extruded Thermoplastic Rubber or Seals:

1. For straight sections, provide preformed seals in continuous lengths.
2. Vulcanize or heat-seal field splice joints to provide watertight joints using manufacturer's recommended procedures.

R. Installation of Preformed Elastomeric Sealant Joint:

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

### **3.4 PROTECTION**

Take proper precautions to protect the expansion joint covers from damage after they are in place.

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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. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- B. Overhead doors including loading docks: Section 08 33 00, COILING DOORS AND GRILLES.
- C. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- D. Glazing: Section 08 80 00, GLAZING.

**1.3 TESTING**

An independent testing laboratory shall perform testing.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers Literature and Data:
  - 1. Fire rated doors and frames, showing conformance with NFPA 80 and Underwriters Laboratory, Inc., or Intertek Testing Services or Factory Mutual fire rating requirements and temperature rise rating for stairwell doors. Submit proof of temperature rating.
  - 2. Sound rated doors, including test report from Testing Laboratory.

**1.5 SHIPMENT**

- A. Prior to shipment label each door and frame to show location, size, door swing and other pertinent information.
- B. Fasten temporary steel spreaders across the bottom of each door frame.

**1.6 STORAGE AND HANDLING**

- A. Store doors and frames at the site under cover.
- B. Protect from rust and damage during storage and erection until completion.

## 1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):  
L-S-125B.....Screening, Insect, Nonmetallic
- C. Door and Hardware Institute (DHI):  
A115 Series.....Steel Door and Frame Preparation for Hardware,  
Series A115.1 through A115.17 (Dates Vary)
- D. Steel Door Institute (SDI):  
113-01.....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  
B209/209M-07.....Aluminum and Aluminum-Alloy Sheet and Plate  
B221/221M-08.....Aluminum and Aluminum-Alloy Extruded Bars,  
Rods, Wire, Profiles and Tubes  
D1621-04.....Compressive Properties of Rigid Cellular  
Plastics  
D3656-07.....Insect Screening and Louver Cloth Woven from  
Vinyl Coated Glass Yarns  
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
- I. Intertek Testing Services (ITS):  
Certifications Listings...Latest Edition
- J. Factory Mutual System (FM):  
Approval Guide

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Sheet Steel: ASTM A1008, cold-rolled for panels (face sheets) of doors.
- B. Anchors, Fastenings and Accessories: Fastenings anchors, clips connecting members and sleeves from zinc coated steel.
- C. Aluminum Sheet: ASTM B209/209M.
- D. Aluminum, Extruded: ASTM B221/221M.
- E. 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. Smoke Doors:
  - 1. Close top and vertical edges flush.
  - 2. Provide seamless vertical edges.
  - 3. Apply Steel astragal to the meeting style at the active leaf of pair of doors or double egress doors.

4. Provide clearance at head, jamb and sill as specified in NFPA 80.

E. Fire Rated Doors (Labeled):

1. Conform to NFPA 80 when tested by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual for the class of door or door opening shown.
2. Fire rated labels of metal, with raised or incised markings of approving laboratory shall be permanently attached to doors.
3. Close top and vertical edges of doors flush. Vertical edges shall be seamless. Apply steel astragal to the meeting stile of the active leaf of pairs of fire rated doors, except where vertical rod exit devices are specified for both leaves swinging in the same direction.
4. Construct fire rated doors in stairwell enclosures for maximum transmitted temperature rise of 230 °C (450 °F) above ambient temperature at end of 30 minutes of fire exposure when tested in accordance with ASTM E152.

## **2.3 METAL FRAMES**

A. General:

1. SDI A250.8, 1.3 mm (0.053 inch) thick sheet steel, types and styles as shown or scheduled.
2. Frames for exterior doors: Fabricate from 1.7 mm (0.067 inch) thick galvanized steel conforming to ASTM A525.
3. Frames for labeled fire rated doors.
  - a. Comply with NFPA 80. Test by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual.
  - b. Fire rated labels of approving laboratory permanently attached to frames as evidence of conformance with these requirements.  
Provide labels of metal or engraved stamp, with raised or incised markings.
4. Frames for doors specified to have automatic door operators; Security doors (Type 36); service window: minimum 1.7 mm (0.067 inch) thick.
5. 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 (Hospital Stop): SDI A250.8. Where indicated on the Drawings, provide stops that terminate 4 inches from the floor.
- D. Glazed Openings:
1. Integral stop on exterior, corridor, or secure side of door.
  2. Design rabbet width and depth to receive glazing material or panel shown or specified.
- E. Frame Anchors:
1. Floor anchors:
    - a. Where floor fills occur, provide extension type floor anchors to compensate for depth of fill.
    - b. At bottom of jamb use 1.3 mm (0.053 inch) thick steel clip angles welded to jamb and drilled to receive two 6 mm (1/4 inch) floor bolts. Use 50 mm x 50 mm (2 inch by 2 inch) 9 mm by (3/8 inch) clip angle for lead lined frames, drilled for 9 mm (3/8 inch) floor bolts.
    - c. Where mullions occur, provide 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two 6 mm (1/4 inch) floor bolts and frame anchor screws.
    - d. Where sill sections occur, provide continuous 1 mm (0.042 inch) thick steel rough bucks drilled for 6 mm (1/4 inch) floor bolts and frame anchor screws. Space floor bolts at 50 mm (24 inches) on center.
  2. Jamb anchors:
    - a. Locate anchors on jambs near top and bottom of each frame, and at intermediate points not over 600 mm (24 inches) apart, except for fire rated frames space anchors as required by labeling authority.
    - b. Form jamb anchors of not less than 1 mm (0.042 inch) thick steel unless otherwise specified.
    - c. Anchors set in masonry: Use adjustable anchors designed for friction fit against the frame and for extension into the masonry not less than 250 mm (10 inches). Use one of following type:
      - 1) Wire loop type of 5 mm (3/16 inch) diameter wire.
      - 2) T-shape or strap and stirrup type of corrugated or perforated sheet steel.

- d. Anchors for stud partitions: Either weld to frame or use lock-in snap-in type. Provide tabs for securing anchor to the sides of the studs.
- e. Anchors for frames set in prepared openings:
  - 1) Steel pipe spacers with 6 mm (1/4 inch) inside diameter welded to plate reinforcing at jamb stops or hat shaped formed strap spacers, 50 mm (2 inches) wide, welded to jamb near stop.
  - 2) Drill jamb stop and strap spacers for 6 mm (1/4 inch) flat head bolts to pass thru frame and spacers.
  - 3) Two piece frames: Subframe or rough buck drilled for 6 mm (1/4 inch) bolts.
- f. Anchors for observation windows and other continuous frames set in stud partitions.
  - 1) In addition to jamb anchors, weld clip anchors to sills and heads of continuous frames over 1200 mm (4 feet) long.
  - 2) Anchors spaced 600 mm (24 inches) on centers maximum.
- g. Modify frame anchors to fit special frame and wall construction and provide special anchors where shown or required.

## **2.4 LOUVERS**

### **A. General:**

- 1. Sight proof type with stationary blades the full thickness of the door.
- 2. Design lightproof louvers to exclude passage of light but permit free ventilation.

### **B. Fabrication:**

- 1. Steel louvers 0.8 mm (0.032 inch) thick for interior doors, and 1.3 mm (0.053 inch) inch thick for exterior doors.
- 2. Fabricate louvers as complete units. Install in prepared cutouts in doors.
- 3. Weld stationary blades to frames. Weld louvers into door openings.

## **2.5 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. Use 9 mm (3/8 inch) bolts on lead lined frames.
2. Power actuated drive pins may be used to secure frame anchors to concrete floors.

C. Jamb Anchors:

1. Anchors in masonry walls: Embed anchors in mortar. Fill space between frame and masonry wall with grout or mortar as walls are built.
2. Coat frame back with a bituminous coating prior to lining of grout filling in masonry walls.
3. Secure anchors to sides of studs with two fasteners through anchor tabs. Use steel drill screws to steel studs.
4. Frames set in prepared openings of masonry or concrete: Expansion bolt to wall with 6 mm (1/4 inch) expansion bolts through spacers. Where subframes or rough bucks are used, 6 mm (1/4 inch) expansion bolts on 600 mm (24 inch) centers or power activated drive pins 600 mm (24 inches) on centers. Secure two piece frames to subframe or rough buck with machine screws on both faces.

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

### 3.2 INSTALLATION OF DOORS AND APPLICATION OF HARDWARE

Install doors and hardware as specified in Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 14 00, INTERIOR WOOD DOORS, and Section 08 71 00, DOOR HARDWARE.

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**SECTION 08 14 00**  
**INTERIOR WOOD DOORS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

- A. Metal door frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- B. Door hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- C. Installation of doors and hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 14 00, INTERIOR WOOD DOORS, or Section 08 71 00, DOOR HARDWARE.
- D. Glazing: Section 08 80 00, GLAZING.
- E. Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Metal louvers: Section 08 90 00, LOUVERS AND VENTS.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
  - 1. Corner section of flush veneered door 300 mm (12 inches) square, showing details of construction, labeled to show grade and type number and conformance to specified standard.
  - 2. Veneer sample 200 mm (8 inch) by 275 mm (11 inch) by 6 mm (1/4 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is accepted.
- C. Shop Drawings:
  - 1. Show every door in project and schedule location in building.
  - 2. Indicate type, grade, finish and size; include detail of glazing, louvers, sound gasketing and pertinent details.
  - 3. Provide information concerning specific requirements not included in the manufacturer's literature and data submittal.

D. Manufacturer's Literature and Data:

1. Sound rated doors, including test report indicating STC rating per ASTM E90 from test laboratory.
2. Labeled fire rated doors showing conformance with NFPA 80.

E. Laboratory Test Reports:

1. Screw holding capacity test report in accordance with WDMA T.M.10.
2. Split resistance test report in accordance with WDMA T.M.5.
3. Cycle/Slam test report in accordance with WDMA T.M.7.
4. Hinge-Loading test report in accordance with WDMA T.M.8.

**1.4 WARRANTY**

A. Doors are subject to terms of Article titled "Warranty of Construction", FAR clause 52.246-21, except that warranty shall be as follows:

1. For interior doors, manufacturer's warranty for lifetime of original installation.

**1.5 DELIVERY AND STORAGE**

- A. Factory seal doors and accessories in minimum of 6 mill polyethylene bags or cardboard packages which shall remain unbroken during delivery and storage.
- B. Store in accordance with WDMA I.S.1-A, J-1 Job Site Information.
- C. Label package for door opening where used.

**1.6 APPLICABLE PUBLICATIONS**

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

A. Window and Door Manufacturers Association (WDMA):

- I.S.1-A-04.....Architectural Wood Flush Doors
- I.S.4-07A.....Water-Repellent Preservative Non-Pressure  
Treatment for Millwork
- I.S.6A-01.....Architectural Wood Stile and Rail Doors
- T.M.5-90.....Split Resistance Test Method
- 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

B. National Fire Protection Association (NFPA):

- 80-07.....Protection of Buildings from Exterior Fire

- 252-08.....Fire Tests of Door Assemblies
- C. 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.
4. Give exposed wood parts of exterior doors a water-repellent preservative treatment in accordance with WDMA I.S.4.

#### **B. Face Veneer:**

1. In accordance with WDMA I.S.1-A.
2. One species throughout the project unless scheduled or otherwise shown.
3. For transparent finishes: Premium Grade, rotary cut, white maple
  - a. A grade face veneer standard optional.
  - b. AA grade face veneer
  - c. Match face veneers for doors for uniform effect of color and grain at joints.
  - d. Door edges shall be same species as door face veneer except maple may be used for stile face veneer on birch doors.

#### **C. Wood for stops, 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.



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.

**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.

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.

**2.3 PREFINISH, PREFIT OPTION**

A. Flush doors may be factory machined to receive hardware, bevels, undercuts, cutouts, accessories and fitting for frame.

B. Factory fitting to conform to specification for shop and field fitting, including factory application of sealer to edge and routings.

C. Flush doors to receive transparent finish (in addition to being prefit) shall be factory finished as follows:

1. WDMA I.S.1-A Section F-3 specification for System TR-4, Conversion Varnish or System TR-5, Catalyzed Vinyl.

2. Use stain when required to produce the finish specified in Section 09 06 00 SCHEDULE FOR FINISHES.

**2.4 IDENTIFICATION MARK:**

A. On top edge of door.

- B. Either a stamp, brand or other indelible mark, giving manufacturer's name, door's trade name, construction of door, code date of manufacture and quality.
- C. Accompanied by either of the following additional requirements:
  - 1. An identification mark or a separate certification including name of inspection organization.
  - 2. Identification of standards for door, including glue type.
  - 3. Identification of veneer and quality certification.
  - 4. Identification of preservative treatment for stile and rail doors.

## **2.5 SEALING:**

Give top and bottom edge of doors two coats of catalyzed polyurethane or water resistant sealer before sealing in shipping containers.

## **PART 3 - EXECUTION**

### **3.1 DOOR PREPARATION**

- A. Field, shop or factory preparation: Do not violate the qualified testing and inspection agency label requirements for fire rated doors.
- B. Clearances between Doors and Frames and Floors:
  - 1. Maximum 3 mm (1/8 inch) clearance at the jambs, heads, and meeting stiles, and a 19 mm (3/4 inch) clearance at bottom, except as otherwise specified.
  - 2. Maximum clearance at bottom of sound rated doors, light-proofed doors, doors to operating rooms, and doors designated to be fitted with mechanical seal: 10 mm (3/8 inch).
- C. Provide cutouts for special details required and specified.
- D. Rout doors for hardware using templates and location heights specified in Section, 08 71 00 DOOR HARDWARE.
- E. Fit doors to frame, bevel lock edge of doors 3 mm (1/8 inch) for each 50 mm (two inches) of door thickness 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 stile 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 COTR.

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**SECTION 08 17 10**  
**INTEGRATED DOOR ASSEMBLIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

- A. Blocking for Hardware: Section 06 10 00, ROUGH CARPENTRY.
- B. Key Cylinders: Section 08 71 00, DOOR HARDWARE
- C. Electrical: Division 26, ELECTRICAL.
- D. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

**1.3 QUALITY ASSURANCE**

- A. Hardware shall be installed by people knowledgeable and skilled in the application, installation and adjustment of commercial grade doors and door hardware. Doors and Frames must be installed plumb, square and level.
- B. Doors frames must be properly prepared and reinforced to install hardware per the manufacturer's template and installation instructions. Install door frames in accordance with ANSI/SDI A250.11 - "Recommended Erection Instructions for Steel Frames."
- C. Contractor shall provide and furnish screws, bolts, expansions shields or other fasteners to facilitate the proper installation of products, not furnished as part of the Integrated Door Assembly.

**1.4 WARRANTY**

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

**1.5 SUBMITTALS**

- A. Submit shop drawings with proposed Integrated Door Assembly system, product and hardware options, in a timely manor to obtain the approval from architect in time to meet construction schedule of other trades.

- B. Provide for each door an frame location; frame type, profile, and installation details, items of finish hardware accessories, finishes, degree of opening and electrical rough-in requirements. Submit required templates to door and frame manufacturers to enable proper and accurate sizing and locations of hardware.
- C. Samples: Provide physical samples as required by Section 01 33 23.
- D. Provide Owner Manual, instruction sheets and installation.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

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

#### **1.7 INSTRUCTIONS**

- A. Manufacturers' Catalog Number References: Where manufacturers' products are specified herein, products of other manufacturers which are considered equivalent to those specified may be used. Manufacturers whose products are specified are identified by abbreviations as follows:

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

#### **1.8 APPLICABLE PUBLICATIONS**

- A. The following references established standards for architectural hardware as specified in this section.
- B. American National Standards Institute (ANSI)

ICC/ANSI A117.1-2003.....Accessible and Usable Buildings and  
Facilities

ANSI/BHMA A156.1-2006.....Butts and Hinges

ANSI/BHMA A156.3-2008.....Exit Devices

ANSI/BHMA A156.4-2008.....Door Controls - Closers

ANSI/BHMA A156.5-2001.....Auxiliary Locks and Associated Products

ANSI/BHMA A156.6-2005.....Architectural Door Trim

ANSI/BHMA A156.7-2009.....Template Hinge Dimensions

ANSI/BHMA A156.8-2005.....Door Controls - Overhead Holders

ANSI/BHMA A156.10-2005.....Power Operated Pedestrian Doors

ANSI/BHMA A156.13-2002.....Mortise Locks and Latches

ANSI/BHMA A156.15-2006.....Closer Holder Release Devices

ANSI/BHMA A156.16-2008.....Auxiliary Hardware

ANSI/BHMA A156.18-2006.....Materials and Finishes

ANSI/BHMA A156.19-2007.....Power Assist and Low Energy Power  
Operated Doors

ANSI/BHMA A156.21-2009.....Thresholds

ANSI/BHMA A156.22-2005.....Door Gasketing Systems

ANSI/BHMA A156.23-2004.....Electromagnetic Locks

ANSI/BHMA A156.24-2003.....Delayed Egress Locking Systems

ANSI/BHMA A156.25-2007.....Electrified Locking Devices

ANSI/BHMA A156.26-2006.....Continuous Hinges

ANSI/BHMA A156.28-2007.....Master Keying Systems

ANSI/BHMA A156.29-2007.....Exit Locks and Alarms

ANSI/BHMA A156.30-2003.....High Security Cylinders

ANSI/BHMA A156.31-2007.....Electric Strikes and Frame Mounted  
Actuators

ANSI/BHMA A156.32-2008.....Integrated Door Opening Assemblies

ANSI/SDI A250.4-2001.....Test Procedure and Acceptance Criteria  
for Physical Evidence for Steel Doors,  
Frames, Frame Anchors and Reinforcings

ANSI/SDI A250.8-2003.....Recommended Specifications for Standard  
Steel Doors and Frames

ANSI/SDI A250.11-2001.....Recommended Erection Instructions for  
Steel Frames

UL10C-2009.....Positive Pressure Fire Tests of Door

## Assemblies

- C. American Society for Testing and Materials (ASTM)
  - 1. ASTM E2074 (2000): Standard Test Method for Fire Tests of Door Assemblies
  - 2. ASTM E2180 (2007): Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials
  - 3. ASTM F476 (2002): Standard Test Method for Security of Swinging Door Assemblies
- D. Door and Hardware Institute (DHI)
  - 1. Recommended Locations for Builder's Hardware for Standard Doors and Frames (2004)
  - 2. Recommended Locations for Builder's Hardware for Custom Steel Doors and Frames (1996)
- E. Metal Door and Frame Associations
  - 1. Hollow Metal Manufacturing Association (HMMA)
    - a. National Association of Architectural Metal Manufacturers (NAAMM)
  - 2. Steel Door Institute (SDI)
- F. Approved Testing Laboratories
  - 1. Underwriter's Laboratories, Inc. (UL)
    - a. UL305 (2007): Panic Hardware
    - b. UL1784 (2004): Air Leakage Tests of Door Assemblies
  - 2. ITS / Intertek Testing Services / Warnock Hersey Inc.
- G. National Fire Protection Association (NFPA)
  - 1. NFPA 70-2008: National Electrical Code
  - 2. NFPA 80-2010: Standard for Fire Doors and Other Opening Protectives
  - 3. NFPA 101-2009: Life Safety Code
  - 4. NFPA 105-2010: Standard for Installation of Smoke Door Assemblies and Other Opening Protectives
  - 5. NFPA 252-2008: Standard Methods of Fire Tests of Door Assemblies
- H. Building Codes [Applicable Building Code]
  - 1. 2009 International Building Code
  - 2. All hardware shall comply with UFAS, (Uniform Federal Accessible Standards - 1998) unless specified otherwise



## **PART 2 - PRODUCTS**

### **2.1 MATERIAL REQUIREMENTS**

#### **A. Integrated Door Assembly requirements:**

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

#### **B. Door Frame requirements:**

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

#### **C. Integrated Hardware Requirements:**

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

around hinge guards and provide stainless steel wrap-around edge guards at the leading edge of the door.

D. Performance Requirements:

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

**2.2 FINISHES**

A. Finish Symbols

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

B. Finish Requirements

1. Door Faces: Prime
2. Frames: Prime
3. Door Hardware:
  - a. Continuous Hinges: 630
  - b. Push Bar: 630 clad with 619 end caps
  - c. Lever Exit Device Trim: 630
  - d. Push/Pull Trim: 626
  - e. Door Closers: 689
  - f. Miscellaneous: To match other finishes
4. Anti-microbial Coating: All hand-operated hardware (levers, pulls, push bars, push plates, paddles, and panic bars) shall be provided with an anti-microbial/anti-fungal coating that has passed ASTM E2180 tests. Coating to consist of ionic silver (Ag+). Silver ions surround bacterial cells, inhibiting growth of bacteria, mold, and mildew by blocking food and respiration supplies.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Contractor is responsible for notification of any wall conditions or building structure that would prevent proper execution of the installation of products produced in accordance with approved hardware

schedule.

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

### **3.2 INSTALLATION**

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

### **3.3 ADJUSTMENT AND CLEANING**

- A. Adjust and check door assembly and each operating item of hardware to ensure correct operation and function. Units which cannot be adjusted to operate as intended for the application made shall be replaced.
- B. Final Adjustment: Wherever hardware installation is made more than a month prior to building acceptance or occupancy of a space or area, the installer shall return to the work during the week prior to acceptance

or occupancy and make final check and adjustment of all hardware items. Hardware Accessories shall be cleaned as necessary to restore correct operation, function, and finish. Do not use cleaners that will harm finish.

### 3.4 PROTECTION

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

### 3.5 SCHEDULES:

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

#### HW-6D

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

EACH [ADO] INTEGRATED DOOR TO HAVE:

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

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

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

**HW-8**

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

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

**HW-12A**

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

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

**HW-12B**

<b>Each [ADO] Pair Integrated Doors to Have:</b>	<b>RATED</b>
1 Steel Frame	
1 Integrated Pair Doors w/Elec	Q2231 x TYPE 8 (E04) ELECTRIC EXIT

Exit Devices	DEVICES (F01 / F08)
2 Continuous Transfer Hinges	A51031B x 8-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Self-Adhesive Astragal	R0Y_14
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

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

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

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

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

#### HW-12C

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

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

#### HW-12D

Each [ADO] Pair Integrated Double Egress Doors to Have:	RATED
1 Steel Frame	
1 Integrated Pair Doors w/Elec Exit Devices	Q2331 x TYPE 8 (E04) ELECTRIC EXIT DEVICES (F01)
2 Continuous Transfer Hinges	A51031B x 8-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL

1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Overlapping Astragal with Self-Adhesive Seal	R5Y634 x R0E154 x THRU-BOLTS
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

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

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

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

#### HW-SH-4

Each [AC, EL, REX, DPS]Integrated Door to Have:	RATED
1 Steel Frame	
1 Integrated Door w/Elec. Exit Device	Q2131 x TYPE 8 ELECTRIC DEVICE (E01, E05/E06-VERIFY)x F13 LEVER
1 Continuous Transfer Hinge	A51031B x 4-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer	C02021 (PT4D, PT4F, PT4H)
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154
1 Alarm Contact	1078-G (G.E. Security), or Equal

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

CARD READER BY DIVISION 28.

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

#### HW-SH-4A

Each [ADO, AC, ELR, REX, DPS] Integrated Door to Have:	RATED
1 Steel Frame	
1 Integrated Door w/Elec Exit	Q2131 x TYPE 8 ELECTRIC DEVICE (E01,

Device	E04)x F13 LEVER
1 Continuous Transfer Hinge	A51031B x 12-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154
1 Alarm Contact	1078-G (G.E. Security), or Equal

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

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

CARD READER BY DIVISION 28.

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

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

#### HW-SH-10

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

POWER, WIRING, AND CONDUIT BY DIVISION 26.

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.



**HW-SH-10A**

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

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

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

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

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

**HW-SH-12**

Each [AC, ADO, EL, REX, DPS] Integrated Door to Have:	NON-RATED
1 Steel Frame	
1 Integrated Door w/Elec. Exit Device	Q2131 x TYPE 8 ELECTRIC DEVICE (E01, E04) x F03 OUTSIDE CYLINDER ONLY
1 Continuous Transfer Hinge	A51031B x 12-THRUWIRE TRANSFER x IN- HINGE ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Offset Pull	J402 x 1" (25mm) DIAMETER x 12" (305mm)CTC
1 Closer	C02021 (PT4D, PT4F, PT4H)
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J35130 x SILICONE GASKET
1 Door Sweep	90100CNB (PEMKO), OR EQUAL

1 Set Frame Seals	2891AS X CSK SCREWS (PEMKO), OR EQUAL
1 Drip	R0Y976
1 Alarm Contact	1078-G (G.E. Security), or Equal

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

CARD READER BY DIVISION 28.

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

- - - E N D - - -

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

#### **B. Frame:**

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

#### **C. Hinge:**

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

#### **D. Lock:**

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

### **2.4 FINISH:**

- A. Provide in accordance with NAAMM AMP 500 series on exposed surfaces.
- B. Steel Surfaces: Baked-on prime coat over a protective phosphate coating.

### **2.5 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 33 00**  
**COILING DOORS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies insulated coiling of size shown, complete as specified.

**1.2 RELATED WORK**

- A. Lock cylinders for cylindrical locks: Section 08 71 00, DOOR HARDWARE.
- B. Electric devices and wiring: DIVISION 26, ELECTRICAL.

**1.3 MANUFACTURER'S AND INSTALLER'S QUALIFICATIONS**

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

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
  - 1. Each type of door showing details of construction, accessories and hardware, electrical and mechanical items supporting brackets for motors, location, and ratings of motors, and safety devices.
  - 2. Wiring diagrams for motors and controls, including wiring diagram for door, showing electrical interlock of motor with manually operated dead lock, electrical rough-in.
- C. Manufacturer's Literature and Data:
  - 1. Brochures or catalog cuts, each type door or grille.
  - 2. Manufacturer's installation procedures and instructions.
  - 3. Maintenance instructions, parts list.
- D. Certificates:
  - 1. Attesting doors, anchors and hardware will withstand the horizontal loads specified.

**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):

- A36/A36M-05.....Structural Steel
- A167-99(R2004).....Stainless and Heat-Resisting Chromium-Nickel  
Steel Plate, Sheet and Strip
- A653/A653M-07.....Steel Sheet, Zinc-Coated (Galvanized) Zinc-Iron  
Alloy-Coated (Galvannealed) by the Hot-Dip  
Process
- B209/209M-06.....Aluminum and Aluminum-Alloy Sheet and Plate
- B221/B221M-06.....Aluminum-Alloy Extruded Bars, Rods, Wire,  
Shapes, and Tubes
- C. National Electrical Manufacturers Association (NEMA):
  - ICS 1-00(R2005).....Industrial Control and Systems General  
Requirements
  - ICS 2-00(R2005).....Industrial Control, and Systems, Controllers,  
Contactors, and Overload Relays
  - ICS 6-93 (R2006).....Industrial Control and Systems Enclosures
  - MG 1-06.....Motors and Generators
  - ST 20-92 (R1997).....Dry-Type Transformers for General Applications
- D. Master Painters Institute (MPI):
  - MPI #35.....Exterior Bituminous Coating
  - MPI #76.....Quick Drying Alkyd Metal Primer
- E. National Fire Protection Association (NFPA):
  - 70-07.....National Electrical Code 1999 Edition
  - 80-06.....Fire Doors and Fire Windows
- F. National Association of Architectural Metal Manufacturers (NAAMM):
  - AMP 500 Series.....Metal Finishes Manual
- G. Underwriters Laboratories, Inc. (UL):
  - 2007.....Fire Resistance Directory

## **PART 2 - PRODUCTS**

### **2.1 MATERIAL**

- A. Steel: A653 for forming operation. ASTM A36 for structural sections.
- B. Alkyd Metal Primer: MPI No. 76.
- C. Bituminous Coating: MPI No. 35.

### **2.2 DESIGN REQUIREMENTS**

- A. Coiling doors shall be spring counter balanced, overhead coiling type, inside face mounted with guides at jambs set back a sufficient distance to provide a clear opening when door is in open position.



- B. Doors, hardware, and anchors shall be designed to withstand a horizontal or wind pressure of 20 psf of door area without damage.
- C. All motor operators shall have manual emergency mechanical operators.

## **2.3 FABRICATION**

### **A. Curtains:**

1. Form of interlocking slats of galvanized steel of shapes standard with the manufacturer, except that slats for exterior doors shall be flat type.
2. Thickness of slats shall be as required to resist loads specified except not less than the following:
  - a. For doors less than 4500 mm (15 feet) wide: 0.75 mm (0.0299 inch).
3. Slat cavity filled with CFC-free, foamed-in-place, polyurethane insulation; R-value: 9.31.

### **B. Endlocks and Windlocks:**

1. Manufacturer's stock design of galvanized malleable iron or galvanized steel or stamped cadmium steel for doors.
2. The ends of each slat for exterior doors shall have endlocks.
3. Doors shall have windlocks at ends of at least every sixth slat. Windlocks shall prevent curtain from leaving guide because of deflection from wind pressure or other forces.

### **C. Bottom Bar:**

1. Two angles of equal weight, one on each side, standard extruded aluminum members not less than 3 mm (0.125 inch) thick.
2. Bottom bar designed to receive weather-stripping and safety device, and be securely fastened to bottom of curtain or grille.

### **D. Barrel and Spring Counterbalance:**

1. Curtain shall coil on a barrel supported at end of opening on brackets and be balanced by helical springs.
2. Barrel fabricated of steel pipe or commercial welded steel tubing of proper diameter and thickness for the size of curtain, to limit deflection with curtain rolled up, not to exceed 1 in 400 (0.03 inch per foot) of span.
3. Close ends of barrel with cast iron plugs, machined to fit the opening.

4. Within the barrel, install an oil-tempered, helical, counter balancing steel spring, capable of producing sufficient torque to assure easy operation of the door curtain from any position.
5. At least 80 percent of the door weight shall be counter balanced at any position.
6. Spring-tension shall be adjustable from outside of bracket without removing the hood or motor operator.

E. Brackets:

1. Steel plate designed to form end closure and support for hood and the end of the barrel assembly.
2. End of barrel or shaft shall screw into bracket hubs fabricated of cast iron or steel.
3. Equip bracket hubs or barrel plugs with prelubricated ball bearings, shielded or sealed.

F. Hoods:

1. Steel galvanized, 0.6 mm (0.0239 inch) thick.
2. Form hood to fit contour of end brackets.
3. Reinforce at top and bottom edges with rolled beads, rods or angles. Hoods more than 3600 mm (12 feet) in length shall have intermediate supporting brackets.
4. Fasten to brackets with screws or bolts and provide for attachment to wall with bolts.
5. Provide a weather baffle at the lintel or inside the hood of each exterior door to minimize seepage of air through the hood enclosure.

G. Guides:

1. Manufacturer's standard formed sections or angles of steel.
  - a. Steel sections not less than 5 mm (3/16 inch) thick.
2. Form a channel pocket of sufficient depth to retain the curtain in place under the horizontal pressure specified, and prevent ends of curtain from slipping out of guide slots.
3. Top sections flared for smooth entry of curtain to vertical sections that will facilitate entry of curtain.
4. Provide stops to limit curtain travel above top of guides.
5. Mounting brackets shall provide closure between guides and jambs.

H. Weather-stripping:

1. Motor Operated Doors: Bottom bar safety device shall be a combination compressible seal and safety device as specified in paragraph, ELECTRIC MOTOR OPERATORS.
2. At exterior doors provide replaceable sweep type continuous vinyl or neoprene weather seals on guides and across head on exterior to seal against wind infiltration.

I. Locking:

1. Cylinder locks shall receive standard screw in cylinders furnished under Section, 08 71 00 DOOR HARDWARE.
2. For motor operated doors provide manufacturer's standard cylinder dead lock type locking device on the inside, key operated from both sides, interlocked with motor to prevent motor from operating when locks are activated.

**2.4 ELECTRIC MOTOR OPERATORS**

- A. Provide operators complete with electric motor, machine cut reduction gears, steel chain and sprockets, magnetic brake, overload protection, brackets, push button controls, limit switches, magnetic reversing contactor, and other accessories necessary for proper operation including emergency manual operator.

B. Design:

1. Design the operator so that the motor may be removed without disturbing the limit-switch timing and without affecting the emergency manual operators.
2. Make provision for emergency manual operation of door by chain-gear mechanism.
3. Arrange the emergency manual operating mechanism so that it may be immediately put into and out of operation from the floor with an electrical or mechanical device, which will disconnect the motor from the operating mechanism when the emergency manual operating mechanism is engaged, and its use shall not affect the timing of the limit switches, in case of electrical failure.
4. Provide interlock with motor to prevent motor from operating when manual locks are activated.

C. Motors:

1. Motors shall conform to NEMA MG1, suitable for operation on current of the characteristics indicated, and shall operate at not more than 3600 rpm. Single-phase motors shall not have commutation or more

than one starting contact. Motor enclosures shall be the drip proof type of NEMA TENV type.

2. Motors shall be high starting torque, reversible type, of sufficient horsepower and torque output to move the door in either direction from any position, and produce a door travel speed of not less than 0.66 foot or more than one foot per second, without exceeding the rated capacity.

D. Controls:

1. The control equipment shall conform to NEMA ICS 1 and 2.
2. Control enclosures shall be NEMA ICS 6, Type 12 or Type 4, except that contractor enclosures may be Type 1.
3. Remote control switches shall be at least 1500 mm (5 feet) above the floor line, and located so that the operator will have complete visibility of the door at all times.
4. Each door motor shall have an enclosed, across-the-line type, magnetic reversing contactor, thermal overload protection, solenoid operated brake, limit switches, and remote control switches at locations shown.
5. Use key activated switches on exterior requiring constant pressure to operate.
6. Use three-button type, push button switch on interior, unless noted to be key activated, with the buttons marked, OPEN, CLOSE, and STOP.
  - a. The OPEN and STOP buttons shall be of the type requiring only momentary pressure to operate. The CLOSE button shall be of the type requiring constant pressure to maintain the closing motion of the door. When the door is in motion, and the STOP button is pressed, the door shall stop instantly and remain in the stop position; from the stop position, the door may then be operated in either direction by the OPEN or Close buttons.
  - b. Push buttons shall be full-guarded to prevent accidental operation.
7. Provide limit switches to automatically stop the doors at their fully open and closed positions. Positions of the limit switches shall be readily adjustable.
8. Safety device:
  - a. The bottom bar of power-operated doors shall have a fail safe safety device that will immediately stop and reverse the door in

its closing travel upon contact with an obstruction in the door opening, or upon failure of the device, or any component of the device, or any component of the control system, and cause the door to return to its full open position. The door closing circuit shall be electrically locked out, and the door shall be operable manually until the failure or damage has been corrected.

- b. Safety device shall not be used as a limit switch.
  - c. Safety device connecting cable to motor shall be flexible "Type SO" cable and spring loaded automatic take up reel or equivalent device, as required for proper operation of the doors.
9. Transformer:
- a. Provide a control transformer in power circuits as necessary to reduce the voltage on the control circuits to 120 volts or less.
  - b. The transformer shall conform to NEMA ST20.
10. Electrical components shall conform to NFPA 70.

## **2.5 FINISHES**

- A. Steel:
- 1. Clean surfaces of steel free from scale, rust, oil and grease, and then apply a light colored shop prime paint after fabrication.
  - 2. Galvanized steel: Apply a phosphate treatment and a corrosion inhibitive primer.
  - 3. Factory apply thermoset powder coating, minimum thickness of 2 mil.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install door in accordance with approved shop drawings and manufacturer's instructions.
- B. Locate anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories accurately.
- C. Securely attach guides to adjoining construction with not less than 9 mm (3/8 inch) diameter bolts, near each end and spaced not over 600 mm (24 inches) apart.
- D. Locate control switches where shown.
- E. Install all electric devices and wiring as specified in DIVISION 26 ELECTRICAL and DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

### **3.2 REPAIR**

- A. Repair prime painted zinc-coated surfaces and bare zinc-coated surfaces that are damaged by the application of galvanizing repair compound.

Spot prime all damaged shop prime painted surfaces including repaired prime painted zinc-coated surfaces.

- B. Coiling Door shall be lubricated, properly adjusted, and demonstrated to operate freely.

### **3.3 INSPECTION**

Upon completion, doors shall be weathertight and doors be free from warp, twist, or distortion.

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**SECTION 08 41 13**  
**ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies aluminum entrance work including storefront construction, hung doors and other components to make a complete assembly.

**1.2 RELATED WORK:**

- A. Glass and Glazing: Section 08 80 00, GLAZING.
- B. Hardware: Section 08 71 00, DOOR HARDWARE.
- C. Automatic Door Operators: Section 08 71 13, AUTOMATIC DOOR OPERATORS.
- D. Texture and color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: (1/2 full scale) showing construction, anchorage, reinforcement, and installation details.
- C. Manufacturer's Literature and Data:
  - 1. Doors, each type.
  - 2. Entrance and Storefront construction.
- D. Samples:
  - 1. Door corner section, 450 mm x 450 mm (18 x 18 inches), of each door type specified, showing vertical and top hinge edges, door closer reinforcement internal reinforcement and
  - 2. Two samples of anodized aluminum of each color showing finish and maximum shade range.
  - 3. Two samples of organic finish of each color specified.
- E. Manufacturer's Certificates:
  - 1. Stating that aluminum has been given specified thickness of anodizing.
  - 2. Indicating manufacturer's qualifications specified.

**1.4 QUALITY ASSURANCE:**

- A. Approval by Contracting Officer is required of products of proposed manufacturer, or supplier, and will be based upon submission by Contractor certification.

- B. Certify manufacturer regularly and presently manufactures aluminum entrances and storefronts as one of their principal products.

#### **1.5 DELIVERY, STORAGE AND HANDLING:**

- A. Deliver aluminum entrance and storefront material to the site in packages or containers; labeled for identification with the manufacturer's name, brand and contents.
- B. Store aluminum entrance and storefront material in weather-tight and dry storage facility.
- C. Protect from damage from handling, weather and construction operations before, during and after installation.

#### **1.6 APPLICABLE PUBLICATIONS:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - B209-06.....Aluminum and Aluminum-Alloy Sheet and Plate
  - B221-05.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
  - E283-04.....Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
  - E331-00.....Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
  - F468-06.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
  - F593-04.....Stainless Steel Bolts, Hex Cap Screws, and Studs
- C. National Association of Architectural Metal Manufacturers (NAAMM):
  - AMP 500 Series.....Metal Finishes Manual
- D. American Architectural Manufacturer's Association (AAMA):
  - 2604-05.....High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels
- E. American Welding Society (AWS):
  - D1.2-03.....Structural Welding Code Aluminum



### **1.7 PERFORMANCE REQUIREMENTS:**

- A. Shapes and thickness of framing members shall be sufficient to withstand a design wind load of not less than 90 mph of supported area with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65 (applied to overall load failure of the unit). Provide glazing beads, moldings, and trim of not less than 1.25 mm (0.050 inch) nominal thickness.
- B. Air Infiltration: When tested in accordance with ASTM E 283, air infiltration shall not exceed  $2.63 \times 10^{-5}$  cm per square meter (0.06 cubic feet per minute per square foot) of fixed area at a test pressure of 0.30 kPa (6.24 pounds per square foot) 80 kilometers (50 mile) per hour wind.
- C. Water Penetration: When tested in accordance with ASTM E 331, there shall be no water penetration at a pressure of 0.38 kPa (8 pounds per square foot) of fixed area.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

- A. Aluminum, ASTM B209 and B221:
  - 1. Alloy 6063 temper T5 for doors, door frames, fixed glass sidelights, storefronts and transoms.
  - 2. Alloy 6061 temper T6 for guide tracks for sliding doors and other extruded structural members.
- B. Thermal Break: Manufacturer standard low conductive material retarding heat flow in the framework, where insulating glass is scheduled.
- C. Fasteners:
  - 1. Aluminum: ASTM F468, Alloy 2024.
  - 2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.

### **2.2 FABRICATION:**

- A. Fabricate doors, of extruded aluminum sections not less than 3 mm (0.125 inch) thick. Fabricate glazing beads of aluminum not less than 1.0 mm (0.050 inch) thick.
- B. Accurately form metal parts and accurately fit and rigidly assemble joints, except those joints designed to accommodate movement. Seal joints to prevent leakage of both air and water.
- C. Make welds in aluminum in accordance with the recommended practice AWA D1.2. Use electrodes and methods recommended by the manufacturers of the metals and alloys being welded. Make welds behind finished surfaces

so as to cause no distortion or discoloration of the exposed side. Clean welded joints of welding flux and dress exposed and contact surfaces.

- D. Make provisions in doors and frames to receive the specified hardware and accessories. Coordinate schedule and template for hardware specified under Section 08 71 00, DOOR HARDWARE. Where concealed closers or other mechanisms are required, provide the necessary space, cutouts, and reinforcement for secure fastening.
- E. Fit and assemble the work at the manufacturer's plant. Mark work that cannot be permanently plant-assembled to assure proper assembly in the field.

### **2.3 PROTECTION OF ALUMINUM:**

- A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by any of the following:
  - 1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint.
  - 2. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
  - 3. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

### **2.4 FRAMES:**

- A. Fabricate doors, frames, mullions, frames for fixed glass and similar members from extruded aluminum not less than 3 mm (0.125 inch) thick.
- B. Provide integral stops and glass rebates and applied snap-on type trim.
- C. Use concealed screws, bolts and other fasteners. Secure cover boxes to frames in back of all lock strike cutouts.
- D. Fabricate framework with thermal breaks in frames where insulating glass is scheduled and specified under Section 08 80 00, GLAZING.

### **2.5 STILE AND RAIL DOORS:**

- A. Nominal 45 mm (1-3/4 inch) thick, with stile and head rail 90 mm (3-1/2 inches) wide, and bottom rail 250 mm (10 inches) wide.
- B. Bevel single-acting doors 3 mm (1/8 inch) at lock, hinge and meeting stile edges. Provide clearances of 2 mm (1/16 inch) at hinge stiles, 3 mm (1/8 inch) at lock stiles and top rails, and 5 mm (3/16 inch) at floors and thresholds. Form glass rebates integrally with stiles and rails. Glazing beads may be formed integrally with stiles and rails or applied type secured with fasteners at 150 mm (six inches) on centers.

- C. Construct doors with a system of welded joints or interlocking dovetail joints between stiles and rails. Clamp door together through top and bottom rails with 9 mm (3/8 inch) primed steel rod extending into the stiles, and having a self-locking nut and washer at each end. Reinforce stiles and rails to prevent door distortion when tie rods are tightened. Provide a compensating spring-type washer under each nut to take up any stresses that may develop. Construct joints between rails and stiles to remain rigid and tight when door is operated.
- D. Weather-stripping: Provide removable, woven pile type (silicone-treated) weather-stripping attached to aluminum or vinyl holder. Make slots for applying weather-stripping integral with doors and door frame stops. Apply continuous weather-stripping to heads, jambs, bottom, and meeting stiles of doors and frames. Install weather-stripping so doors can swing freely and close positively.

#### **2.6 REINFORCEMENT FOR BUILDERS HARDWARE:**

- A. Fabricate from stainless steel plates.
- B. Hinge and pivot reinforcing: 4.55 mm (0.1793 inch) thick.
- C. Reinforcing for lock face, flush bolts, concealed holders, concealed or surface mounted closers: 2.66 mm (0.1046 inch) thick.
- D. Reinforcing for all other surface mounted hardware: 1.5 mm (0.0598 inch) thick.

#### **2.7 COLUMN COVERS AND TRIM**

- A. Fabricate column covers and trim shown from 1.5 mm (0.0625 inch) thick sheet aluminum of longest available lengths.
- B. Use concealed fasteners.
- C. Provide aluminum stiffener and other supporting members shown or as required to maintain the integrity of the components.

#### **2.8 FINISH**

- A. In accordance with NAAMM AMP 500 series.
- B. Powder Coat Finish: AAMA 2604.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION:**

- A. Allowable Installation Tolerances: Install work plumb and true, in alignment and in relation to lines and grades shown. Variation of 3 mm (1/8 inch) in 2400 mm (eight feet), non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.

- B. Anchor aluminum frames to adjoining construction at heads, jambs and bottom and to steel supports, and bracing. Anchor frames with stainless steel or aluminum countersunk flathead, expansion bolts or machine screws, as applicable. Use aluminum clips for internal connections of adjoining frame sections.
- C. Where work is installed within masonry or concrete openings, place no parts other than built-in anchors and provision for operating devices located in the floor, until after the masonry or concrete work is completed.
- D. Install hardware specified under Section 08 71 00, DOOR HARDWARE.
- E. Install hung door operators specified under Section 08 71 13, AUTOMATIC DOOR OPERATORS.

### **3.2 ADJUSTING:**

After installation of entrance and storefront work is completed, adjust and lubricate operating mechanisms to insure proper performance.

### **3.3 PROTECTION, CLEANING AND REPAIRING:**

Remove all mastic smears and other unsightly marks, and repair any damaged or disfiguration of the work. Protect the installed work against damage or abuse.

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**SECTION 08 51 13**  
**ALUMINUM WINDOWS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Aluminum windows of type (storefront and curtainwall) and size shown, complete with hardware, related components and accessories.
- B. Types:
  - 1. Fixed

**1.2 DEFINITIONS**

- A. Accessories: Staff beads, casings, closures, trim, panning systems, sub-sills, clips anchors, fasteners, weather-stripping, insect screens and other necessary components required for fabrication and installation of window units.
- B. Uncontrolled Water: Water not drained to the exterior, or water appearing on the room side of the window.

**1.3 RELATED WORK**

- A. Steel subframes: Section 05 50 00, METAL FABRICATIONS.
- B. Storefront: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- C. Glazing: Section 08 80 00, GLAZING.
- D. Color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.4 DELIVERY, STORAGE AND HANDLING**

- A. Protect windows from damage during handling and construction operations before, during and after installation.
- B. Store windows under cover, setting upright.
- C. Do not stack windows flat.
- D. Do not lay building materials or equipment on windows.

**1.5 QUALITY ASSURANCE**

- A. Approval by contracting officer is required of products or service of proposed manufacturers and installers.
- B. Approval will be based on submission of certification by Contractor that:
  - 1. Manufacturer regularly and presently manufactures the specified windows as one of its principal products.
  - 2. Installer has technical qualifications, experience, trained personnel and facilities to install specified items.

- C. Provide each type of window produced from one source of manufacture.
- D. Quality Certified Labels or certificate:
  - 1. Architectural Aluminum Manufacturers Association, "AAMA label" affixed to each window indicating compliance with specification.
  - 2. Certificates in lieu of label with copy of recent test report (not more than 4 years old) from an independent testing laboratory and certificate signed by window manufacturer stating that windows provided comply with specified requirements and AAMA 101/I.S.2 for type of window specified.
- E. There is no blast-resistance requirement for these windows.

#### **1.6 SUBMITTAL**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
  - 1. Minimum of 1/2 full scale types of windows on project.
  - 2. Identifying parts of window units by name and kind of metal or material, show construction, locking systems, mechanical operators, trim, installation and anchorages.
  - 3. Include glazing details and standards for factory glazed units.
- C. Manufacturer's Literature and Data:
  - Window.
- D. Certificates:
  - 1. Certificates as specified in paragraph QUALITY ASSURANCE.
  - 2. Indicating manufacturers and installers qualifications.
  - 3. Manufacturer's Certification that windows delivered to project are identical to windows tested.
- E. Test Reports:
  - Copies of test reports as specified in paragraph QUALITY ASSURANCE.
- F. Samples: Provide 150 mm (six-inch) length samples showing finishes, specified.

#### **1.7 WARRANTY**

Warrant windows against malfunctions due to defects in thermal breaks, hardware, materials and workmanship, subject to the terms of Article "WARRANTY OF CONSTRUCTION", FAR clause 52.246-21.

## **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 Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)  
90.1-07.....Energy Standard of Buildings
- C. American Architectural Manufacturers Association (AAMA):  
101/I.S.2/A440-08.....Windows, Doors, and Unit Skylights  
505-09.....Dry Shrinkage and Composite Performance Thermal Cycling Test Procedures  
2605-05.....Superior Performing Organic Coatings on Architectural Aluminum Extrusions and Panels  
TIR-A8-08.....Structural Performance of Poured and Debridged Framing Systems
- D. American Society for Testing and Materials (ASTM):  
A653/A653M-09.....Steel Sheet, Zinc Coated (Galvanized), Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-dip Process  
E 90-09.....Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
- E. National Fenestration Rating Council (NFRC):  
NFRC 100-10.....Determining Fenestration Product U-Factors  
NFRC 200-10.....Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
- F. National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500-06.....Metal Finishes Manual

## **PART 2- PRODUCTS**

### **2.1 MATERIALS**

- A. Aluminum Extrusions; Sheet and Plate: AAMA 101/I.S.2.
- B. Sheet Steel, Galvanized: ASTM A653; G90 galvanized coating.
- C. Insect Screening:  
1. Heavy-duty, pet screening, made from vinyl-coated polyester, as manufactured by Phifer Pet Screen; color: Gray.

- D. Fasteners: AAMA 101/I.S.2. Screws, bolts, nuts, rivets and other fastening devices to be non-magnetic stainless steel.
1. Fasteners to be concealed when window is closed. Where wall thickness is less than 3 mm (0.125 inch) thick, provide backup plates or similar reinforcements for fasteners.
  2. Stainless steel self tapping screws may be used to secure Venetian blind hanger clips, vent guide blocks, friction adjuster, and limit opening device.

## **2.2 THERMAL AND CONDENSATION PERFORMANCE**

- A. Condensation Resistance Factor (CRF): Minimum CRF of C 50.
- B. Thermal Transmittance:
1. Maximum U value class for insulating glass windows: 50 (U=0.50).
- C. Solar Heat Gain Coefficient (SHGC): SHGC shall comply with State or local energy code requirement.

## **2.3 FABRICATION**

- A. Fabrication to exceed or meet requirements of Physical Load Tests, Air Infiltration Test, and Water Resistance Test of AAMA 101/I.S.2.
- B. Glazing:
1. Factory or field glazing optional.
  2. Glaze in accordance with Section 08 80 00, GLAZING.
  3. Windows reglazable without dismantling sash framing.
  4. Design rabbet to suit glass thickness and glazing method specified.
  5. Glaze from interior except where not accessible.
  6. Provide removable fin type glazing beads.
- C. Trim:
1. Trim includes casings, closures, and panning.
  2. Fabricate to shapes shown of aluminum not less than 1.6 mm (0.062 inch) thick
  3. Extruded or formed sections, straight, true, and smooth on exposed surfaces.
  4. Exposed external corners mitered and internal corners coped; fitted with hairline joints.
  5. Reinforce 1.6 mm (0.062 inch) thick members with not less than 3 mm (1/8-inch) thick aluminum.
  6. Except for strap anchors, provide reinforcing for fastening near ends and at intervals not more than 305 mm (12 inches) between ends.



7. Design to allow unrestricted expansion and contraction of members and window frames.
8. Secure to window frames with machine screws or expansion rivets.
9. Exposed screws, fasteners or pop rivets are not acceptable on exterior of the casing or trim cover system.

D. Thermal-Break Construction:

1. Manufacturer's double thermal breaks.
2. Low conductance thermal barrier.
3. Capable of structurally holding sash in position and together.
4. All Thermal Break Assemblies (Pour & Debridge, Insulbar or others) shall be tested as per AAMA TIR A8 and AAMA 505 for Dry Shrinkage and Composite Performance.
5. Location of thermal barrier and design of window shall be such that, in closed position, outside air shall not come in direct contact with interior frame of the window.

E. Mullions: AAMA 101.

F. Subsills, Stools, and Break Metal Jambs:

1. Fabricate to shapes shown of not less than 2 mm (0.080 inch) thick extruded aluminum.
2. One piece full length of opening with concealed anchors.
3. Sills turned up back edge not less than 6 mm (1/4 inch). Front edge provide with drip.
4. Sill back edge behind face of window frame. Do not extend to interior surface or bridge thermal breaks.
5. Do not perforate for anchorage, clip screws, or other requirements.

G. Storefront: Basis-of-Design Product:

1. Trifab 451UT, by Kawneer, or approved equal by COTR.

H. Curtainwall: Basis-of-Design Product:

1. 1600UT System 1, or approved equal by COTR.
  - a). 2-1/4" sightline; 6 inch overall depth; 3/4" deep front cover.
2. Load criteria for curtainwall used as Balcony 269 guardrail:
  - a.) Guards shall be designed to resist a load of 0.73 kN/m (50 pounds per lineal foot) applied in any direction at the top and to transfer this load through the supports to the structure. Guards shall resist a single concentrated load of 0.89 kN(200 pounds), applied in any direction at any point along the top, and to transfer this load through the supports to the structure

- this load need not to be assumed to act concurrently with the lineal meter loading.

## **2.4 FIXED WINDOWS**

- A. AAMA 101/I.S.2; Type HC25.
- B. AAMA certified product to the AAMA 101/I.S.2. - 97 standard.

## **2.5 FINISH**

- A. In accordance with NAAMM AMP 500 series.
- B. Finish exposed aluminum surfaces as follows:
- C. Powder coat finish: AAMA 2604.

## **PART 3 - EXECUTION**

### **3.1 PROTECTION (DISSIMILAR MATERIALS): AAMA 101/I.S.2.**

### **3.2 INSTALLATION, GENERAL**

- A. Install window units in accordance with manufacturer's specifications and recommendations for installation of window units, hardware, operators and other components of work.
- B. Where type, size or spacing of fastenings for securing window accessories or equipment to building construction is not shown or specified, use expansion or toggle bolts or screws, as best suited to construction material.
  - 1. Provide bolts or screws minimum 6 mm (1/4-inch) in diameter.
  - 2. Sized and spaced to resist the tensile and shear loads imposed.
  - 3. Do not use exposed fasteners on exterior, except when unavoidable for application of hardware.
  - 4. Provide non-magnetic stainless steel Phillips flat-head machine screws for exposed fasteners, where required, or special tamper-proof fasteners.
  - 5. Locate fasteners to not disturb the thermal break construction of windows.
- C. Set windows plumb, level, true, and in alignment; without warp or rack of frames or sash.
- D. Anchor windows on four sides with anchor clips or fin trim.
  - 1. Do not allow anchor clips to bridge thermal breaks.
  - 2. Use separate clips for each side of thermal breaks.
  - 3. Make connections to allow for thermal and other movements.
  - 4. Do not allow building load to bear on windows.

5. Use manufacturer's standard clips at corners and not over 600 mm (24 inches) on center.
6. Where fin trim anchorage is shown build into adjacent construction, anchoring at corners and not over 600 mm (24 inches) on center.

E. Sills and Stools:

1. Set in bed of mortar or other compound to fully support, true to line shown.
2. Do not extend sill to inside window surface or past thermal break.
3. Leave space for sealants at ends and to window frame unless shown otherwise.

F. Insect Screening:

1. Provide continuous aluminum edge banding to allow for glazing-in of insect screening. Glaze in aluminum screen panels at Balcony 269 curtainwall sections; all lines and/or apparent grid lines should align. Remove panels if alignment isn't achieved.

### **3.3 MULLIONS CLOSURES, TRIM, AND PANNING**

- A. Cut mullion full height of opening and anchor directly to window frame on each side.
- B. Closures, Trim, and Panning: External corners mitered and internal corners coped, fitted with hairline, tightly closed joints.
- C. Secure to concrete or solid masonry with expansion bolts, expansion rivets, split shank drive bolts, or powder actuated drive pins.
- D. Toggle bolt to hollow masonry units. Screwed to wood or metal.
- E. Fasten except for strap anchors, near ends and corners and at intervals not more than 300 mm (12 inches) between.
- F. Seal units following installation to provide weathertight system.

### **3.4 ADJUST AND CLEAN**

- A. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes.
- B. Remove excess glazing and sealant compounds, dirt, and other substances.
- C. Clean glass promptly after installation of windows. Remove glazing and sealant compound, dirt and other substances.
- D. Except when a window is being adjusted or tested, keep locked in the closed position during the progress of work on the project.

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**SECTION 08 71 00**  
**DOOR HARDWARE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

Door hardware and related items necessary for complete installation and operation of doors.

**1.2 RELATED WORK**

- A. Caulking: Section 07 92 00 JOINT SEALANTS.
- B. Application of Hardware: Section 08 14 00, WOOD DOORS , Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 17 10, INTEGRATED DOOR ASSEMBLIES , Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS , Section 08 42 29, AUTOMATIC ENTRANCES , Section 08 71 13, AUTOMATIC DOOR OPERATORS ,Section 08 71 13.11, LOW ENERGY DOOR OPERATORS
- C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Painting: Section 09 91 00, PAINTING.
- E. Card Readers: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.
- F. Electrical: Division 26, ELECTRICAL.
- G. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

**1.3 GENERAL**

- A. All hardware shall comply with UFAS, (Uniform Federal Accessible Standards) unless specified otherwise.
- B. Provide rated door hardware assemblies where required by most current version of the International Building Code (IBC).
- C. Hardware for Labeled Fire Doors and Exit Doors: Conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, large size, or better grades are specified herein under paragraph HARDWARE SETS. In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements.
- D. Hardware for application on metal and wood doors and frames shall be 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.

#### **1.4 WARRANTY**

Automatic door operators shall be subject to the terms of FAR Clause 52.24-21

#### **1.5 MAINTENANCE MANUALS**

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:

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**

Deliver items of hardware to job site in their original containers, complete with necessary appurtenances including screws, keys, and instructions. Tag one of each different item of hardware and deliver to Resident Engineer for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in Resident Engineer's office until all other similar items have been installed in project, at which time the Resident Engineer will deliver items on file to Contractor for installation in predetermined locations on the project.

#### **1.8 PREINSTALLATION MEETING**

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
Ives / IR	Ingersoll Rand	Indianapolis, IN
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: All cylinders shall be keyed into existing // Great // Grand Master Key System //. Provide removable core cylinders that are removable only with a special key or tool without disassembly of knob or lockset . Cylinders shall be 6 pin type. Keying information shall be furnished at a later date by the Resident Engineer.
- D. Keying: A new Great Grandmaster key shall be established for this project. The key system shall be small format (Best size and profile) removable core type as previously described. The key blanks shall be protected by a utility patent with a minimum seven years remaining on

the patent from the start of construction, and protected by contract-controlled distribution. The manufacturer shall furnish code pattern listings in both paper and electronic formats so keys may be reproduced by code.; provide electronic format in file type required by project's key control software. The manufacturer shall design the new key system with the capacity to rekey the existing system and also provide for 25 percent expansion capability beyond this requirement. Submit a keying chart for approval showing proposed keying layout and listing expansion capacity.

1. Keying information will be furnished to the Contractor by the Resident Engineer.
2. Supply information regarding key control of cylinder locks to manufacturers of equipment having cylinder type locks. Notify Resident Engineer immediately when and to whom keys or keying information is supplied. Return all such keys to the Resident Engineer.

#### **1.10 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. In text, hardware items are referred to by series, types, etc., listed in such specifications and standards, except as otherwise specified.
- B. American Society for Testing and Materials (ASTM):
  - F883-04.....Padlocks
  - E2180-07.....Standard Test Method for Determining the  
Activity of Incorporated Antimicrobial Agent(s)  
In Polymeric or Hydrophobic Materials
- C. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):
  - A156.1-06.....Butts and Hinges
  - A156.2-03.....Bored and Pre-assembled Locks and Latches
  - A156.3-08.....Exit Devices, Coordinators, and Auto Flush  
Bolts
  - A156.4-08.....Door Controls (Closers)
  - A156.5-01.....Auxiliary Locks and Associated Products
  - A156.6-05.....Architectural Door Trim



- A156.8-05.....Door Controls-Overhead Stops and Holders
- A156.12-05 .....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 CONTINUOUS HINGES**

A. ANSI/BHMA A156.26, Grade 1-600.

1. Listed under Category N in BHMA's "Certified Product Directory."

B. General: Minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete

C. Continuous, Barrel-Type Hinges: Hinge with knuckles formed around a Teflon-coated 6.35mm (0.25-inch) minimum diameter pin that extends entire length of hinge.

1. Base Metal for Exterior Hinges: Stainless steel.
2. Base Metal for Interior Hinges: Stainless steel.
3. Base Metal for Hinges for Fire-Rated Assemblies: Stainless steel.

4. Provide with non-removable pin (hospital tip option) at lockable outswing doors.
5. Where required to clear adjacent casing, trim, and wall conditions and allow full door swing, provide wide throw hinges of minimum width required.
6. Provide with manufacturer's cut-outs for separate mortised power transfers and/or mortised automatic door bottoms where they occur.
7. Where thru-wire power transfers are integral to the hinge, provide hinge with easily removable portion to allow easy access to wiring connections.
8. Where models are specified that provide an integral wrap-around edge guard for the hinge edge of the door, provide manufacturer's adjustable threaded stud and machine screw mechanism to allow the door to be adjusted within the wrap-around edge guard.

### **2.3 DOOR CLOSING DEVICES**

Closing devices shall be products of one manufacturer for each type specified.

### **2.4 OVERHEAD CLOSERS**

- A. Conform to ANSI A156.4, Grade 1.
- B. Closers shall conform to the following:
  1. The closer shall have minimum 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back check effective between 60 degrees and 85 degrees of door opening.
  2. Where specified, closer shall have hold-open feature.
  3. Size Requirements: Provide multi-size closers, sizes 1 through 6, except where multi-size closer is not available for the required application.
  4. Material of closer body shall be forged or cast.
  5. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.
  6. Where closers are exposed to the exterior or are mounted in rooms that experience high humidity, provide closer body and arm assembly of stainless steel material.
  7. Closers shall have full size metal cover; plastic covers will not be accepted.

8. Closers shall have adjustable hydraulic back-check, separate valves for closing and latching speed, adjustable back-check positioning valve, and adjustable delayed action valve.
9. Provide closers with any accessories required for the mounting application, including (but not limited to) drop plates, special soffit plates, spacers for heavy-duty parallel arm fifth screws, bull-nose or other regular arm brackets, longer or shorter arm assemblies, and special factory templating. Provide special arms, drop plates, and templating as needed to allow mounting at doors with overhead stops and/or holders.
10. Closer arms or backcheck valve shall not be used to stop the door from overswing, except in applications where a separate wall, floor, or overhead stop cannot be used.
11. Provide parallel arm closers with heavy duty rigid arm.
12. Where closers are to be installed on the push side of the door, provide parallel arm type except where conditions require use of top jamb arm.
13. Provide all surface closers with the same body attachment screw pattern for ease of replacement and maintenance.
14. All closers shall have a 1 ½" (38mm) minimum piston diameter.

## **2.6 COMBINATION CLOSER - HOLDER**

- A. Conform to ANSI A156.15; combination closer-holder with built-in electronic release.
- B. Combination closer-holder shall have the following features:
  1. Control door closing and latching sequence by hydraulic action.
  2. Wiring for 24V DC current. Current draw shall not exceed 0.16 amperes.
  3. Combination closer-holder type:
    - a. At doors with 90-110° hold-open point: Single lever arm with slide track closing action, and adjustable hydraulic back-check. Provide tracks with spring-cushion stop assemblies to avoid the necessity of a separate wall or floor stop. Provide with double egress arm where required.
    - b. At doors with over 110° to 175° hold-open point: Single or double lever arm and adjustable hydraulic back-check. Provide with long arms where required for deep frame reveals.

4. Spring power for closing force shall conform to ANSI A156.4 and have 50% spring power adjustment.
5. Size closers per manufacturer's printed catalog recommendations.
6. Hold open mechanism shall hold door open between 85 degrees and 175 degrees depending on wall and frame conditions. Mount device to provide maximum door opening permitted by building construction or equipment.
7. Electronic release shall release door when signaled by smoke detector. Smoke detectors shall not be incorporated as an integral part of door holders. Smoke detectors are specified in the ELECTRICAL Section.
8. All closers to have full covers.
9. All closers shall have a 1 ½" minimum piston diameter and an adjustable back check position valve.

## **2.7 DOOR STOPS**

- A. Conform to ANSI A156.16.
- B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For concrete, masonry or quarry tile construction, use lead expansion shields for mounting door stops.
- C. Where cylindrical locks with turn pieces or pushbuttons occur, equip wall bumpers Type L02251 (rubber pads having concave face) to receive turn piece or button.
- D. Provide floor stops (Type L02141 or L02161 in office areas; Type L02121 x 3 screws into floor elsewhere. Wall bumpers, where used, must be installed to impact the trim or the door within the leading half of its width. Floor stops, where used, must be installed within 4-inches of the wall face and impact the door within the leading half of its width.
- E. Where drywall partitions occur, use floor stops, Type L02141 or L02161 in office areas, Type L02121 elsewhere.
- F. Provide stop Type L02011, as applicable for exterior doors. At outswing doors where stop can be installed in concrete, provide stop mated to concrete anchor set in 76mm (3-inch) core-drilled hole and filled with quick-setting cement.
- G. Omit stops where floor mounted door holders are required and where automatic operated doors occur.

- H. Provide appropriate roller bumper for each set of doors (except where closet doors occur) where two doors would interfere with each other in swinging.
- I. Provide appropriate door mounted stop on doors in individual toilets where floor or wall mounted stops cannot be used.
- J. Provide overhead surface applied stop Type C02541, ANSI A156.8 on patient toilet doors in bedrooms where toilet door could come in contact with the bedroom door.
- K. Provide door stops on doors where combination closer magnetic holders are specified, except where wall stops cannot be used or where floor stops cannot be installed within 4-inches of the wall.
- L. Where the specified wall or floor stop cannot be used, provide concealed overhead stops (surface-mounted where concealed cannot be used).

## **2.8 OVERHEAD DOOR STOPS AND HOLDERS**

Conform to ANSI Standard A156.8. Overhead holders shall be of sizes recommended by holder manufacturer for each width of door. Set overhead holders for 110 degree opening, unless limited by building construction or equipment. Provide Grade 1 overhead concealed slide type: stop-only at rated doors and security doors, hold-open type with exposed hold-open on/off control at all other doors requiring overhead door stops.

## **2.9 FLOOR DOOR HOLDERS**

Conform to ANSI Standard A156.16. Provide extension strikes for Types L01301 and L01311 holders where necessary.

## **2.10 LOCKS AND LATCHES**

- A. Conform to ANSI A156.2. Locks and latches for doors 45 mm (1-3/4 inch) thick or over shall have beveled fronts. Lock cylinders shall have not less than seven pins. Cylinders for all locksets shall be removable core type. Cylinders shall be furnished with construction removable cores and construction master keys. Cylinder shall be removable by special key or tool. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the Great Grand Master Key System. Disassembly of lever or lockset shall not be required to remove core from lockset. All locksets or latches on double doors with fire label shall have latch bolt with 19 mm (3/4 inch) throw, unless shorter throw allowed by the door manufacturer's fire

label. Provide temporary keying device or construction core of allow opening and closing during construction and prior to the installation of final cores.

B. In addition to above requirements, locks and latches shall comply with following requirements:

1. Mortise Lock and Latch Sets: Conform to ANSI/BHMA A156.13. Mortise locksets shall be series 1000, minimum Grade 2. All locksets and latchsets, except on designated doors in Psychiatric (Mental Health) areas, shall have lever handles fabricated from cast stainless steel. Provide sectional (lever x rose) lever design matching Basis-of-Design Product: Door Lockset: Corbin Russwin Core - CL-7-IC7 Handle Style and Finish \*LWB 626 Keyway\* 59A2, Zero Bited. 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).

#### **2.11 ELECTRIC STRIKES**

- A. ANSI/ BHMA A156.31 Grade 1.
- B. General: Use fail-secure electric strikes at fire-rated doors.

#### **2.12 KEYS**

- A. Stamp all keys with change number and key set symbol. Furnish keys in quantities as follows:

<b>Locks/Keys</b>	<b>Quantity</b>
Cylinder locks	2 keys each
Cylinder lock change key blanks	100 each different key way
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys
Control key	2 keys

- B. Psychiatric keys shall be cut so that first two bittings closest to the key shoulder are shallow to provide greater strength at point of greatest torque.

#### **2.13 KEY CABINET**

- A. ANSI Standard A156.5. Provide key cabinet made of cold rolled, 1.2 mm (0.0478 inch) thick furniture steel electro-welded. Doors shall have "no sag" continuous brass-pin piano type hinge and be equipped with chrome plated locking door handles, hook cam and mechanical pushbutton door lock. Key Cabinet and Key Control System shall accommodate all keys for this project plus 25 percent. Provide minimum number of



multiple cabinets where a single cabinet of largest size will not accommodate the required number of keys.

- B. Key tags shall consist of two sets: Permanent self-locking and loan key snaphook type with tag colors as follows: Red fiber marker of the permanent self-locking type approximately 32 mm (1-1/4 inch) in diameter engraved with the legend "FILE KEY MUST NOT BE LOANED." Also furnish for each hook a white cloverleaf key marker with snap-hooks engraved with the legend "LOAN KEY."
- C. The manufacturer of the lock cylinders and locks shall attach a key tag to keys of each lock cylinder and shall mark thereon the respective item number and key change number. Provide each group of keys in a key gathering envelope (supplied by Key Cabinet Manufacturer) in which the lock manufacturer shall include the following information: Item number, key change number and door number. The contractor shall furnish the Key Cabinet Manufacturer the hardware and keying schedules and change keys.
- D. The Key Cabinet Manufacturer shall set up a three-way cross index system, including master keys, listing the keys alphabetically, the hooks numerically and the key changes numerically on different colored index cards. Index cards shall be typewritten and inserted in a durable binder. Attach the keys to the two sets of numbered tags supplied with the cabinet. (The permanent tag and the loan key tag). Instruct the owner in proper use of the system. Install cabinet as directed by the Resident Engineer.

#### **2.14 ARMOR PLATES, KICK PLATES, MOP PLATES AND DOOR EDGING**

- A. Conform to ANSI Standard A156.6.
- B. Provide protective plates and door edging as specified below:
  - 1. Kick plates, mop plates and armor plates of metal, Type J100 series.
  - 2. Provide kick plates and mop plates where specified. Kick plates shall be 254 mm (10 inches) or 305 mm (12 inches) high. Mop plates shall be 152 mm (6 inches) high. Both kick and mop plates shall be minimum 1.27 mm (0.050 inches) thick. Provide kick and mop plates beveled on all 4 edges (B4E). On push side of doors where jamb stop extends to floor, make kick plates 38 mm (1-1/2 inches) less than width of door, except pairs of metal doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other kick and mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick

and mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.

3. Kick plates and/or mop plates are not required on following door sides:
  - a. Armor plate side of doors;
  - b. Exterior side of exterior doors;
  - c. Closet side of closet doors;
  - d. Both sides of aluminum entrance doors.
4. Armor plates for doors are listed under Article "Hardware Sets".

Armor plates shall be thickness as noted in the hardware set, 875 mm (35 inches) high and 38 mm (1-1/2 inches) less than width of doors, except on pairs of metal doors. Provide armor plates beveled on all 4 edges (B4E). Plates on pairs of metal doors shall be 25 mm (1 inch) less than width of each door. Where top of intermediate rail of door is less than 875 mm (35 inches) from door bottom, extend armor plates to within 13 mm (1/2 inch) of top of intermediate rail. On doors equipped with panic devices, extend armor plates to within 13 mm (1/2 inch) of panic bolt push bar.
5. Where louver or grille occurs in lower portion of doors, substitute stretcher plate and kick plate in place of armor plate. Size of stretcher plate and kick plate shall be 254 mm (10 inches) high.
6. Provide stainless steel edge guards where so specified at wood doors. Provide mortised type instead of surface type except where door construction and/or ratings will not allow. Provide edge guards of bevel and thickness to match wood door. Provide edge guards with factory cut-outs for door hardware that must be installed through or extend through the edge guard. Provide full-height edge guards except where door rating does not allow; in such cases, provide edge guards to height of bottom of typical lockset armor front. Forward edge guards to wood door manufacturer for factory installation on doors.

## **2.15 EXIT DEVICES**

- A. Conform to ANSI Standard A156.3. Exit devices shall be Grade 1; type and function are specified in hardware sets. Provide flush with finished floor strikes for vertical rod exit devices in interior of building. Trim shall have cast satin stainless steel lever handles of design similar to locksets, unless otherwise specified. Provide key

cylinders for keyed operating trim and, where specified, cylinder dogging.

- B. Surface vertical rod panics shall only be provided less bottom rod; provide fire pins as required by exit device and door fire labels. Do not provide surface vertical rod panics at exterior doors.
- C. Concealed vertical rod panics shall be provided less bottom rod at interior doors, unless lockable or otherwise specified; provide fire pins as required by exit device and door fire labels. Where concealed vertical rod panics are specified at exterior doors, provide with both top and bottom rods.
- D. Where removable mullions are specified at pairs with rim panic devices, provide mullion with key-removable feature.
- E. At non-rated openings with panic hardware, provide panic hardware with key cylinder dogging feature.
- F. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

#### **2.16 FLUSH BOLTS (LEVER EXTENSION)**

- A. Conform to ANSI A156.16. Flush bolts shall be Type L24081 unless otherwise specified. Furnish proper dustproof strikes conforming to ANSI A156.16, for flush bolts required on lower part of doors.
- B. Lever extension manual flush bolts shall only be used at non-fire-rated pairs for rooms only accessed by maintenance personnel.
- C. Face plates for cylindrical strikes shall be rectangular and not less than 25 mm by 63 mm (1 inch by 2-1/2 inches).
- D. Friction-fit cylindrical dustproof strikes with circular face plate may be used only where metal thresholds occur.
- E. Provide extension rods for top bolt where door height exceeds 2184 mm (7 feet 2 inches).

#### **2.17 FLUSH BOLTS (AUTOMATIC)**

- A. Conform to ANSI A156.3. Dimension of flush bolts shall conform to ANSI A115. Bolts shall conform to Underwriters Laboratories, Inc., requirements for fire door hardware. Flush bolts shall automatically latch and unlatch. Furnish dustproof strikes conforming to ANSI A156.16 for bottom flushbolt. Face plates for dustproof strike shall be rectangular and not less than 38 mm by 90 mm (1-1/2 by 3-1/2 inches).

- B. At interior doors, provide auto flush bolts less bottom bolt, unless otherwise specified, except at wood pairs with fire-rating greater than 20 minutes; provide fire pins as required by auto flush bolt and door fire labels.

#### **2.18 DOOR PULLS**

Conform to ANSI A156.6. Pull plate 90 mm by 350 mm (3-1/2 inches by 14 inches), unless otherwise specified. Cut plates of door pulls for cylinders, or turn pieces where required.

#### **2.19 PUSH PLATES**

Conform to ANSI A156.6. Metal, Type J302, 200 mm (8 inches) wide by 350 mm (14 inches) high. Provide metal Type J300 plates 100 mm (4 inches wide by 350 mm (14 inches) high) where push plates are specified for doors with stiles less than 200 mm (8 inches) wide. Cut plates for cylinders, and turn pieces where required.

#### **2.20 COMBINATION PUSH AND PULL PLATES**

Conform to ANSI 156.6. Type J303, stainless steel 3 mm (1/8 inch) thick, 80 mm (3-1/3 inches) wide by 800 mm (16 inches) high), top and bottom edges shall be rounded. Secure plates to wood doors with 38 mm (1-1/2 inch) long No. 12 wood screws. Cut plates for turn pieces, and cylinders where required. Pull shall be mounted down.

#### **2.21 COORDINATORS**

Conform to ANSI A156.16. Coordinators, when specified for fire doors, shall comply with Underwriters Laboratories, Inc., requirements for fire door hardware. Coordinator may be omitted on exterior pairs of doors where either door will close independently regardless of the position of the other door. Coordinator may be omitted on interior pairs of non-labeled open where open back strike is used. Open back strike shall not be used on labeled doors. Paint coordinators to match door frames, unless coordinators are plated. Provide bar type coordinators, except where gravity coordinators are required at acoustic pairs. For bar type coordinators, provide filler bars for full width and, as required, brackets for push-side surface mounted closers, overhead stops, and vertical rod panic strikes.

#### **2.22 THRESHOLDS**

- A. Conform to ANSI A156.21, mill finish extruded aluminum, except as otherwise specified. In existing construction, thresholds shall be installed in a bed of sealant with ¼-20 stainless steel machine screws

and expansion shields. In new construction, embed aluminum anchors coated with epoxy in concrete to secure thresholds. Furnish thresholds for the full width of the openings.

- B. For thresholds at elevators entrances see other sections of specifications.
- C. At exterior doors and any interior doors exposed to moisture, provide threshold with non-slip abrasive finish.
- D. Provide with miter returns where threshold extends more than 12 mm (0.5 inch) from frame face.

#### **2.23 AUTOMATIC DOOR BOTTOM SEAL AND RUBBER GASKET FOR LIGHT PROOF OR SOUND CONTROL DOORS**

Conform to ANSI A156.22. Provide mortise or under-door type, except where not practical. For mortise automatic door bottoms, provide type specific for door construction (wood or metal).

#### **2.24 WEATHERSTRIPS (FOR EXTERIOR DOORS)**

Conform to ANSI A156.22. Air leakage shall not to exceed 0.50 CFM per foot of crack length ( $0.000774\text{m}^3/\text{s/m}$ ).

#### **2.25 MISCELLANEOUS HARDWARE**

- A. Access Doors (including Sheet Metal Types): Except for fire-rated doors and doors to Temperature Control Cabinets, equip each single or double metal access door with Lock Type E76213, conforming to ANSI A156.5. Key locks as directed. Ship lock prepaid to the door manufacturer. Hinges shall be provided by door manufacturer.
- B. Cylinders for Various Partitions and Doors: Key cylinders same as entrance doors of area in which partitions and door occur, except as otherwise specified. Provide cylinders to operate locking devices where specified for following partitions and doors:
- C. Mutes: Conform to ANSI A156.16. Provide door mutes or door silencers Type L03011 or L03021, depending on frame material, of white or light gray color, on each steel or wood door frame, except at fire-rated frames, lead-lined frames and frames for sound-resistant, lightproof and electromagnetically shielded doors. Furnish 3 mutes for single doors and 2 mutes for each pair of doors, except double-acting doors. Provide 4 mutes or silencers for frames for each Dutch type door. Provide 2 mutes for each edge of sliding door which would contact door frame.

## **2.26 THERMOSTATIC TEMPERATURE CONTROL VALVE CABINETS**

- A. Where lock is shown, equip each cabinet door (metal) with lock Type E06213, conforming to ANSI A156.5. Key locks in Key Sets approved by Contracting Officer. See mechanical drawings and specifications for location of cabinets.
- B. Cabinet manufacturer shall supply the hinges, bolts and pulls. Ship locks to cabinet manufacturer for installation.

## **2.27 FINISHES**

- A. Exposed surfaces of hardware shall have ANSI A156.18, finishes as specified below. Finishes on all hinges, ~~pivots~~, closers, thresholds, etc., shall be as specified below under "Miscellaneous Finishes." For field painting (final coat) of ferrous hardware, see Section 09 91 00, PAINTING.
- B. 626 or 630: All surfaces on exterior and interior of buildings, except where other finishes are specified.
- C. Miscellaneous Finishes:
  - 1. Hinges --exterior doors: 626 or 630.
  - 2. Hinges --interior doors: 652 or 630.
  - 3. Pivots: Match door trim.
  - 4. Door Closers: Factory applied paint finish. Dull or Satin Aluminum color.
  - 5. Thresholds: Mill finish aluminum.
  - 6. Cover plates for floor hinges and pivots: 630.
  - 7. Other primed steel hardware: 600.
- D. Hardware Finishes for Existing Buildings: U.S. Standard finishes shall match finishes of hardware in (similar) existing spaces // except where otherwise specified. //
- E. Special Finish: Exposed surfaces of hardware for dark bronze anodized aluminum doors shall have oxidized oil rubbed bronze finish (dark bronze) finish on door closers shall closely match doors.
- F. Anti-microbial Coating: All hand-operated hardware (levers, pulls, push bars, push plates, paddles, and panic bars) shall be provided with an anti-microbial/anti-fungal coating that has passed ASTM E2180 tests. Coating to consist of ionic silver (Ag+). Silver ions surround bacterial cells, inhibiting growth of bacteria, mold, and mildew by blockading food and respiration supplies.

## **2.28 BASE METALS**

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

<b>Finish</b>	<b>Base Metal</b>
652	Steel
626	Brass or bronze
630	Stainless steel

## **PART 3 - EXECUTION**

### **3.1 HARDWARE HEIGHTS**

- A. For new buildings locate hardware on doors at heights specified below, with all hand-operated hardware centered within 864 mm (34 inches) to 1200 mm (48 inches), unless otherwise noted:
- 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 // except security bedroom, bathroom and anteroom doors which shall have closer installed parallel arm on exterior side of doors. //. 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 Resident Engineer. Existing hinges shall not be reused on door openings having new doors and new frames. Coordinate preparation for hinge cut-outs and screw-hole locations on doors and frames.

**E. Hinges Required Per Door:**

Doors 1500 mm (5 ft) or less in height	2 butts
Doors over 1500 mm (5 ft) high and not over 2280 mm (7 ft 6 in) high	3 butts
Doors over 2280 mm (7 feet 6 inches) high	4 butts
Dutch type doors	4 butts
Doors with spring hinges 1370 mm (4 feet 6 inches) high or less	2 butts
Doors with spring hinges over 1370 mm (4 feet 6 inches)	3 butts

F. Fastenings: Suitable size and type and shall harmonize with hardware as to material and finish. Provide machine screws and lead expansion shields to secure hardware to concrete, ceramic or quarry floor tile, or solid masonry. Fiber or rawl plugs and adhesives are not permitted. All fastenings exposed to weather shall be of nonferrous metal.



G. After locks have been installed; show in presence of Resident Engineer that keys operate their respective locks in accordance with keying requirements. (All keys, Master Key level and above shall be sent Registered Mail to the Medical Center Director along with the bitting list. Also a copy of the invoice shall be sent to the Resident Engineer for his records.) Installation of locks which do not meet specified keying requirements shall be considered sufficient justification for rejection and replacement of all locks installed on project.

### **3.3 FINAL INSPECTION**

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**

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**

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)

### **INTERIOR SINGLE DOORS**

HW-2

Each Door to Have:

RATED/NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Keyed Privacy Indicator Lock	F13 x OCCUPANCY INDICATOR
1 Closer	C02011/C02021 (PT4D, PT4F, PT4H)
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

STONE THRESHOLD BY OTHER TRADES.

HW-3E

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Closer	C02051/C02061 (PT4D, PT4H)
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154
1 Coat Hook	L03121

OMIT COAT HOOK WHERE GLASS LITE PREVENTS INSTALLATION.

HW-4M

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Classroom Hospital Lock	F08 x PADDLES POINTING DOWN
1 Closer	C02051/C02061 (PT4D, PT4H)
1 Heavy-Duty Armor Plate	J101 x 3.175 MM (0.125 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

HW-5B

Each Door to Have:

RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Closer	C02011/C02021 (PT4D, PT4F, PT4H)
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

HW-5D

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Kick Plate	J102 (@ STORAGE, EVM, & HAC ROOMS ONLY)
1 Floor Stop (@ Inswing Doors)	L02121 x 3 FASTENERS
1 Wall Stop (@ Outswing Doors)	L52101 CONVEX
3 Silencers	L03011

**INTERIOR PAIRS OF DOORS**

HW-8

Each [MHO] Pair Integrated Doors to Have:

RATED

ALL HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

HW-10A

Each [ADO] Pair to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
2 Transfer Hinge	4 or 8-WIRE TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Lock	F08
1 Electric Unlatch Strike	MUNL (FAIL-SECURE), 24VDC (SECURITRON), OR EQUAL
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R5Y634 x R0E154 x THRU-BOLTS
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
2 Auto Door Bottoms	R0Y346 - HEAVY DUTY
2 Set Self-Adhesive Seals	R0E154

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

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

**EXTERIOR SINGLE DOORS**

HW-E1Each Door to Have:NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Entry Lock	F11
1 Latch Protector (outswing dr)	MLP-111 (DON-JO), OR EQUAL
1 Closer	C02011/C02021 (PT4D, PT4F, PT4H)
1 Kick Plate	J102
1 Floor Stop	1214CK x 1268CK (TRIMCO), OR EQUAL
1 Threshold (outswing door)	J35130 x SILICONE GASKET
1 Threshold (inswing door)	ALUMINUM, PER ARCHITECTURAL DETAIL
1 Door Sweep	90100CNB (PEMKO), OR EQUAL
1 Set Frame Seals	2891AS X CSK SCREWS (PEMKO), OR EQUAL
1 Drip	R0Y976

HW-E3Each Door to Have:NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F13-MOD x RIGID OUTSIDE LEVER x KEY RETRACTS DEADBOLT AND LATCHBOLT
1 Latch Protector (outswing dr)	MLP-111 (DON-JO), OR EQUAL
1 Closer	C02011/C02021 (PT4D, PT4H)
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Armor Plate	J101 x 3.125 MM (0.125 INCH) THICKNESS
1 Overhead Holder	C01511-ADJUSTABLE
1 Threshold (outswing door)	J35130 x SILICONE GASKET
1 Threshold (inswing door)	ALUMINUM, PER ARCHITECTURAL DETAIL
1 Door Sweep	90100CNB (PEMKO), OR EQUAL
1 Set Frame Seals	2891AS X CSK SCREWS (PEMKO), OR EQUAL
1 Drip	R0Y976

HW-E4

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Anti-Vandal Pull	1097HASP (TRIMCO), OR EQUAL
1 Exit Device	TYPE 1 F03 LES TRIM
1 Key Cylinder	TYPE AS REQUIRED
1 Closer	C02011 (PT4D, PT4F, PT4H)
1 Kick Plate	J102
1 Floor Stop	1214CK x 1268CK (TRIMCO), OR EQUAL
1 Threshold	J35130 x SILICONE GASKET
1 Door Sweep	90100CNB (PEMKO), OR EQUAL
1 Set Frame Seals	2891AS X CSK SCREWS (PEMKO), OR EQUAL
1 Drip	R0Y976

**EXTERIOR PAIRS OF DOORS**

HW-E8

Each Pair to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25
1 Dust Proof Strike	L04021
1 Storeroom Lock	F13-MOD x RIGID OUTSIDE LEVER x KEY RETRACTS DEADBOLT AND LATCHBOLT
1 Overlapping Astragal with Self-Adhesive Seal	R5Y634 x R0E154 x THRU-BOLTS
1 Coordinator	TYPE 21A
2 Closer	C02011/C02021 (PT4D, PT4F, PT4H)
2 Armor Plate	J101 x 3.125 MM (0.125 INCH) THICKNESS
2 Floor Stop	1214CK x 1268CK (TRIMCO), OR EQUAL
1 Threshold (outswing door)	J35130 x SILICONE GASKET
1 Threshold (inswing door)	ALUMINUM, PER ARCHITECTURAL DETAIL
2 Door Sweep	90100CNB (PEMKO), OR EQUAL
1 Set Frame Seals	2891AS X CSK SCREWS (PEMKO), OR EQUAL
1 Drip	R0Y976

HW-E9

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
2 Anti-Vandal Pull	1097HASP (-NC @ INACTIVE LEAF) (TRIMCO), OR EQUAL
1 Exit Device	TYPE 8 F01
1 Exit Device	TYPE 8 F12 LESS PULL
1 Key Cylinder	TYPE AS REQUIRED
1 Set Meeting Stile Astragals	R3E834
2 Closer	C02011 (PT4D, PT4F, PT4H)
2 Kick Plate	J102
2 Floor Stop	1214CK x 1268CK (TRIMCO), OR EQUAL
1 Threshold	J35130 x SILICONE GASKET
2 Door Sweep	90100CNB (PEMKO), OR EQUAL
1 Set Frame Seals	2891AS X CSK SCREWS (PEMKO), OR EQUAL
1 Drip	R0Y976

**RESIDENTIAL UNIT SINGLE DOOR**

HW-R1

Each Door to Have:

NON-RATED/RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Guestroom Card Lock	BY OTHER SECTION.
1 Closer (@ Rated Doors)	C02011 (PT4D, PT4F PT4H)
1 Floor Stop	L02121 x 3 FASTENERS
2 Door Viewers	L03221 - 190°
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 - HEAVY DUTY
2 Sets Self-Adhesive Seals	R0E154

#### HW-R1A

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Guestroom Card Lock	BY OTHER SECTION.
1 Latch Protector (@ O/S Drs)	MLP-111 (DON-JO), OR EQUAL
1 Closer	C02011/C02021 (PT4D, PT4F PT4H)
1 Kick Plate	J102
1 Floor Stop (@ I/S Doors)	L02121 x 3 FASTENERS
1 Overhead Stop (@ O/S Doors)	C01541-ADJUSTABLE
1 Threshold (outswing door)	J35130 x SILICONE GASKET
1 Threshold (inswing door)	ALUMINUM, PER ARCHITECTURAL DETAIL
1 Door Sweep	90100CNB (PEMKO), OR EQUAL
1 Set Frame Seals	2891AS X CSK SCREWS (PEMKO), OR EQUAL
1 Drip	R0Y976

#### HW-R2

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Latchset	F75
1 Base Stop	L02031 x 3 FASTENERS
3 Silencers	L03011



HW-R2B

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Latchset	F75
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 - HEAVY DUTY
2 Sets Self-Adhesive Seals	R0E154

HW-R2C

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Push/Pull Plate Set	1894-4 x 1195-1 PULL (TRIMCO), OR EQUAL
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J102
1 Closer	C02011/C02021 (PT4D, PT4F, PT4H)
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 - HEAVY DUTY
2 Sets Self-Adhesive Seals	R0E154

HW-R3

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Privacy	F76B
1 Base Stop	L02031 x 3 FASTENERS
1 Coat Hook	L03121
3 Silencers	L03011

HW-R3A

Each Door to Have:

NON-RATED

	Hinges	QUANTITY & TYPE AS REQUIRED
1	Privacy	F76B
1	Base Stop	L02031 x 3 FASTENERS
1	Coat Hook	L03121
1	Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1	Auto Door Bottom	R0Y346 - HEAVY DUTY
2	Sets Self-Adhesive Seals	R0E154

AT TOILET ROOMS, OMIT METAL THRESHOLD; STONE THRESHOLD BY OTHER TRADES.

SECURITY HARDWARE ABBREVIATIONS LEGEND:

AC = Access Control Device (Card reader, biometric reader, keypad, etc.)  
ADO = Automatic Door Operator  
DEML = Delayed Egress Magnetic Lock  
DEPH = Delayed Egress Panic Exit Device  
DPS = Door Position Switch (Door or Alarm Contact)  
EL = Electric Lock or Electric Lever Exit Device  
PB = Push-button Combination Lock (stand-alone)  
RR = Remote Release Button  
ELR = Electric Latch Retraction Exit Device  
REX = Request-to-Exit Switch in Latching Device Inside Trim

**INTERIOR SINGLE SECURITY DOORS**

HW-SH-3

Each [AC, EL, REX, DPS] Door to Have:

RATED/NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Transfer Hinge	4 or 8-WIRE TYPE AS REQUIRED
1 Electrified Lock	F07 (E01-REX, E06) 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer	C02011/C02021 (PT4D, PT4F, PT4H)
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 - HEAVY DUTY
2 Sets Self-Adhesive Seals	R0E154
1 Alarm Contact	1078-G (G.E. SECURITY), OR EQUAL

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.  
CARD READER BY DIVISION 28.

HW-SH-3C

Each [PB] Door to Have:

NON-RATED/RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Push-button Combination Lock	N3 - A156.13 F07 G1 E06
1 Closer	C02011/C02021 (PT4D, PT4F, PT4H)
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

HW-SH-3D

Each [AC, EL, REX, DPS] Door to Have:

RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Transfer Hinge	4 or 8-WIRE TYPE AS REQUIRED
1 Electrified Lock	F07 (E01-REX, E06) 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer	C02011/C02021 (PT4D, PT4F, PT4H)
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 - HEAVY DUTY
2 Sets Self-Adhesive Seals	R0E154
1 Alarm Contact	1078-G (G.E. SECURITY), OR EQUAL

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.  
CARD READER BY DIVISION 28.

HW-SH-4B

Each [ADO, AC, EL, REX, DPS] Door to Have:

RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Transfer Hinge	12-WIRE TYPE AS REQUIRED
1 Electrified Exit Device	TYPE 1 (E01-REX, E04) F13 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Power Supply	TYPE REQUIRED BY PANIC MANUFACTURER X ADO BOARD
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING  
(RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).  
AUTOMATIC DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR  
OPERATORS.

HW-SH-9A

Each [PB] Pair to Have:

RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25
1 Dust Proof Strike	L04021
1 Push-button Combination Lock	N3 - A156.13 F07 G1 E06
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R5Y634 x R0E154 x THRU-BOLTS
2 Closers	C02011/C02021 (PT4D, PT4F, PT4H)
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

- - - E N D - - -

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies equipment, controls and accessories for automatic operation of swing doors (Doors 100A, 100B, 162, 200B, 263, and 263A).

**1.2 RELATED WORK**

- A. Hollow metal doors and frames; Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- B. Door hardware; Section 08 71 00, DOOR HARDWARE.
- C. Glass and glazing of doors and frames; Section 08 80 00, GLAZING.
- D. Electric general wiring, connections and equipment requirements; Division 26, ELECTRICAL.
- E. 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**

Automatic door operators shall be subject to the terms of the "Warranty of Construction" Article of Section 00 72 00, GENERAL CONDITIONS

**1.5 MAINTENANCE MANUALS**

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 COTR 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**

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 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.

## **2.4 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 (Doors **100A**, **100B**, **162**, and **200B**, only):

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 (Doors **263** and **263A**, only): 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.

## **2.5 SAFETY DEVICES**

- A. General: Area over which doors swing shall be a safety section and anyone standing in path of door's movement shall be protected by a safety device.
- B. 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.
- C. Time delay switches shall be adjustable between 3 to 60 seconds and shall control closing cycle of doors.
- D. 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 COTR.

### **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 COTR.

- - - E N D - - -

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies glass, related glazing materials and accessories. Glazing products specified apply to factory or field glazed items.

**1.2 RELATED WORK**

Factory glazed by manufacturer in following units:

1. Sound resistant doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS.
2. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
3. Section 08 51 13, ALUMINUM WINDOWS (Single Hung).
4. Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.
5. Section 28 16 11, INTRUSION DETECTION SYSTEM.

**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 COTR.

B. Permanent labels:

1. Locate in corner for each pane.
2. Label in accordance with ANSI Z97.1 and SGCC (Safety Glass Certification Council) label requirements.
  - a. Tempered glass.
  - b. Laminated glass or have certificate for panes without permanent label.
  - c. Organic coated glass.

**1.4 PERFORMANCE REQUIREMENTS**

A. Building Enclosure Vapor Retarder and Air Barrier:

1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.

2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

B. Glass Thickness:

1. Select thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with applicable code.
2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
3. Test in accordance with ASTM E 330.
4. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

C. Glass Used in Balcony Guardrail:

1. Glass used in the Balcony 269 guardrail must be clear laminated safety glazing, complying with Category II of CPSC 16 CFR 1201 or Class A of ANSI Z97.1.

## **1.5 SUBMITTALS**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Certificates:

1. Certificates stating that wire glass, meets requirements for safety glazing material as specified in ANSI Z97.1.
2. Certificate on shading coefficient.
3. Certificate on "R" value when value is specified.

- C. Warranty: Submit written guaranty, conforming to General Condition requirements, and to "Warranty of Construction" Article in this Section.

D. Manufacturer's Literature and Data:

1. Glass, each kind required.
2. Insulating glass units.
3. Elastic compound for metal sash glazing.
4. Glazing cushion.
5. Sealing compound.

E. Samples:

1. Size: 150 mm by 150 mm (6 inches by 6 inches).
2. Tinted glass.

- F. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.
- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.
- D. Protect laminated security glazing units against face and edge damage during entire sequence of fabrication, handling, and delivery to installation location. Provide protective covering on exposed faces of glazing plastics, and mark inside as "INTERIOR FACE" or "PROTECTED FACE":
1. Treat security glazing as fragile merchandise, and packaged and shipped in export wood cases with width end in upright position and blocked together in a mass. Storage and handling shall comply with Manufacturer's directions and as required to prevent edge damage or other damage to glazing resulting from effects of moisture, condensation, temperature changes, direct exposure to sun, other environmental conditions, and contact with chemical solvents.
  2. Protect sealed-air-space insulating glazing units from exposure to abnormal pressure changes, as could result from substantial changes in altitude during delivery by air freight. Provide temporary breather tubes which do not nullify applicable warranties on hermetic seals.
  3. Temporary protections: The glass front and polycarbonate back of glazing shall be temporarily protected with compatible, peelable, heat-resistant film which will be peeled for inspections and re-applied and finally removed after doors and windows are installed at destination. Since many adhesives will attack polycarbonate, the

film used on exposed polycarbonate surfaces shall be approved and applied by manufacturer.

4. Edge protection: To cushion and protect glass clad, polycarbonate, and Noviflex edges from contamination or foreign matter, the four edges shall be sealed the depth of glazing with continuous standard-thickness Santoprene tape. Alternatively, continuous channel shaped extrusion of Santoprene shall be used, with flanges extending into face sides of glazing.
5. Protect "Constant Temperature" units including every unit where glass sheet is directly laminated to or directly sealed with metal-tube type spacer bar to polycarbonate sheet, from exposures to ambient temperatures outside the range of 16 to 24 C, during the fabricating, handling, shipping, storing, installation, and subsequent protection of glazing.

#### **1.7 PROJECT CONDITIONS**

Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

#### **1.8 WARRANTY**

Warranty: Conform to terms of "Warranty of Construction", FAR clause 52.246-21

#### **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.  
C794-06.....Adhesion-in-Peel of Elastomeric Joint Sealants.





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.
  - 2. Thickness, as indicated.
  - 3. Coordinate color/tint/coating to accommodate required security monitoring.
- C. Low emissivity coated glass:
  - 1. ASTM C1036, Type I, Class 2, Quality q3.
  - 2. Color: Clear.
  - 3. Thickness, 6 mm (1/4 inch) 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 .
- B. Clear Tempered Glass:
  - 1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
  - 2. Thickness, 6 mm (1/4 inch), or as indicated otherwise.

### **2.3 COATED GLASS**

- A. Low-E Tempered Glass:
  - 1. ASTM C1048, Kind FT, Condition C, Type I, Class 1, Quality q3 with low emissivity pyrolytic coating having an E of 0.15.
  - 2. Apply coating to second surface of insulating glass units.
  - 3. Thickness, 4.8 mm (3/16 inch), or as indicated as indicated otherwise.

#### **2.4 LAMINATED GLASS (BALCONY 269 GUARDRAIL)**

- A. Two or more lites of glass bonded with an interlayer material for use in building glazing
- B. Clear Interlayer:
- C. Use min. 0.75 mm (0.030 inch) thick interlayer for vertical glazing where 1.5 mm (0.060 inch) interlayer is not otherwise shown or required.

#### **2.5 LAMINATED GLAZING ASSEMBLIES**

- A. Clear Glazing:
  - 1. Both panes clear glass ASTM C1036, Type I, Class 1, Quality q3.
  - 2. Thickness: Each pane, 4.8 mm (3/16 inch) thick

#### **2.6 INSULATING GLASS UNITS**

- A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space and comply with ASTM E2190.
- B. Assemble units using glass types specified:
- C. Sealed Edge Units (SEU):
  - 1. Insulating Glass Unit Makeup
    - a. Outboard Lite
      - 1. Glass type: Clear with Low-E
      - 2. Glass Tint: Clear
      - 3. Nominal Thickness: 1/4"
      - 4. Glass Strength: (Heat-Strengthened, Tempered where required)
      - 5. Coating Orientation: (Surface #2)
    - b. Spacer
      - 1. Nominal Thickness:
      - 2. Gas Fill: (90% Argon)
    - c. Inboard Lite
      - 1. Glass Type: Clear
      - 2. Glass Tint: Clear
      - 3. Nominal Thickness: 1/4"
      - 4. Glass Strength: (Heat-Strengthened, Tempered where required)
  - 2. Performance Characteristics (Center of Glass)

- a. Winter U-factor (U-value): 0.40
- b. Shading Coefficient (SC): 0.4 per ASHRAE 90.1-2007
- c. Solar heat Gain Coefficient (SHGC): 0.40
- 3. Glass shall be annealed, heat strengthened or tempered as required by codes, or as required to meet thermal stress and wind loads.
- 4. Glass heat-treated by horizontal (roller hearth) process with inherent roller wave distortion parallel to the bottom edge of the glass as installed when specified.

## **2.7 FIRE RATED GLASS IN DOORS**

- A. Acceptable Manufacturers:
  - 1. Technical Glass Products "Firelite" single thickness, 4.8 mm (3/16 inch) nominal thickness.
  - 2. Advanced Glass Systems Corporation "Pyrovue Commercial", similar to insulating glass with the cavity filled with a gel.
- B. Products shall carry UL Classifications as to Fire Resistance. See UL Fire Resistant Directory U439 and R10178 (N) and Building Materials Directory, glazing Materials (KCMZ) R13377-1.
- C. Maximum size is 0.84 m<sup>2</sup> (1296 square inches) for transoms, side lights, borrowed lights, and windows.

## **2.8 GLAZING ACCESSORIES**

- A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work shall have a finish that will not corrode or stain while in service.
- B. Setting Blocks: ASTM C864:
  - 1. Channel shape; having 6 mm (1/4 inch) internal depth.
  - 2. Shore a hardness of 80 to 90 Durometer.
  - 3. Block lengths: 50 mm (two inches) except 100 to 150 mm (four to six inches) for insulating glass.
  - 4. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
  - 5. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.
- C. Spacers: ASTM C864:
  - 1. Channel shape having a 6 mm (1/4 inch) internal depth.

2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
3. Lengths: One to 25 to 76 mm (one to three inches).
4. Shore a hardness of 40 to 50 Durometer.

D. Sealing Tapes:

1. Semi-solid polymeric based material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.

E. Glazing Gaskets: ASTM C864:

1. Firm dense wedge shape for locking in sash.
2. Soft, closed cell with locking key for sash key.
3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.

F. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.

G. Glazing Sealants: ASTM C920, silicone neutral cure:

1. Type S.
2. Class 25
3. Grade NS.
4. Shore A hardness of 25 to 30 Durometer.

H. Neoprene or EPDM, Glazing Gasket: ASTM C864.

1. Channel shape; flanges may terminate above the glazing channel or flush with the top of the channel.
2. Designed for dry glazing.

I. Color:

1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames shall match color of the finished aluminum and be nonstaining.
2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted shall be black, gray, or neutral color.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions:
  - 1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
  - 2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer's approved shop drawings.
- B. Advise Contractor of conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation: Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units to prevent damage to glass and glazing units by cleaning materials.

### **3.2 PREPARATION**

- A. For sealant glazing, prepare glazing surfaces in accordance with GANA-02 Sealant Manual.
- B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.
- C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.
- D. Verify that components used are compatible.
- E. Clean and dry glazing surfaces.
- F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

### **3.3 INSTALLATION - GENERAL**

- A. Install in accordance with GANA-01 Glazing Manual and GANA-02 Sealant Manual unless specified otherwise.
- B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.
- C. Set glazing without bending, twisting, or forcing of units.
- D. Do not allow glass to rest on or contact any framing member.
- E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.

- F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- G. Laminated Glass:
  - 1. Tape edges to seal interlayer and protect from glazing sealants.
  - 2. Do not use putty or glazing compounds.
- H. Insulating Glass Units:
  - 1. Glaze in compliance with glass manufacturer's written instructions.
  - 2. When glazing gaskets are used, they shall be of sufficient size and depth to cover glass seal or metal channel frame completely.
  - 3. Do not use putty or glazing compounds.
  - 4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.
  - 5. Install with tape or gunnable sealant in wood sash.
- I. Fire Resistant Glass:
  - 1. Wire glass: Glaze in accordance with NFPA 80.
  - 2. Other fire resistant glass: Glaze in accordance with UL design requirements.

### **3.4 INSTALLATION - DRY METHOD (TAPE AND GASKET SPLINE GLAZING)**

- A. Cut glazing tape to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.
- B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Trim protruding tape edge.

### **3.5 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)**

- A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.

- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
- F. Fill gap between glazing and stop with silicone type sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line.
- G. Apply cap bead of silicone type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

### **3.6 INSTALLATION - WET METHOD (SEALANT AND SEALANT)**

- A. Place setting blocks at 1/4 points and install glazing pane or unit.
- B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- C. Fill gaps between glazing and stops with silicone type sealant to depth of bite on glazing, but not more than 9 mm (3/8 inch) below sight line to ensure full contact with glazing and continue the air and vapor seal.
- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

### **3.7 REPLACEMENT AND CLEANING**

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by COTR.
- B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.
- C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

### **3.8 PROTECTION**

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

### **3.9 GLAZING SCHEDULE**

#### **A. Fire Resistant Glass:**

1. Install clear wire glass in interior fire rated or labeled doors and windows.
2. Install clear wire glass in exterior windows and doors indicated to receive wire glass.
3. Use Fire Resistant Glass without wire mesh where rated construction is required.

#### **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.
4. Use SEU clear tempered insulating glass on storefronts and sidelights.
5. Use SEU tinted tempered and clear tempered insulating glass on storefront and sidelights.
6. Use SEU Low E tempered and clear glass, G-41, on storefront and sidelights.
7. Use SEU reflective tempered and clear tempered glass on storefront and sidelights.
8. Use tinted tempered glass in exterior pane and clear tempered glass in interior pane unless specified otherwise of insulating glass units adjacent to door.
9. Use clear tempered glass in exterior and interior panes unless specified otherwise at insulating glass units adjacent to door.

#### **C. Clear Glass:**

1. Interior observation windows not specified otherwise.
2. Interior pane of dual glazed windows not receiving tempered, laminated or organic coated glass, or other special glass indicated or specified.



D. Tinted Glass: Exterior pane of dual glazed windows not receiving tinted tempered glass.

E. Insulating Glass:

1. Install SEU clear tempered glass in windows, interior pane of dual glazed windows, storefronts, curtain walls, adjacent to entrances or walks.

2. Install SEU clear glass in windows, interior pane of dual glazed windows, storefronts, curtain walls, not adjacent to entrances or walks.

3. Install SEU tempered and clear tempered glass in storefronts, curtain walls adjacent to entrances or walks.

F. Laminated Glass: Install as specified in Balcony 269 guardrail.

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**SECTION 08 90 00**  
**LOUVERS AND VENTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies fixed wall louvers and louvered vents (for venting roof overbuild areas).

**1.2 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:  
Each type, showing material, finish, size of members, method of assembly, and installation and anchorage details.
- C. Manufacturer's Literature and Data:  
Each type of louver and vent.

**1.3 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. The Master Painters Institute (MPI):  
Approved Product List - November 2007
- C. American Society for Testing and Materials (ASTM):
  - A167-99(R2004).....Stainless and Heat-Resisting Chromium - Nickel Steel Plate, Sheet, and Strip
  - A1008/A1008M REV A-07...Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability
  - B209/B209M-07.....Aluminum and Aluminum Alloy, Sheet and Plate
  - B221-06.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
  - B221M-07.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire Shapes, and Tubes
- D. National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500-505 (1988).....Metal Finishes Manual
- E. National Fire Protection Association (NFPA):  
90A-02.....Installation of Air Conditioning and Ventilating Systems
- F. American Architectural Manufacturers Association (AAMA):

605-98.....High Performance Organic Coatings on  
Architectural Extrusions and Panels

G. Air Movement and Control Association, Inc. (AMCA):  
500-L-99.....Testing Louvers

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Aluminum, Extruded: ASTM B221/B221M.
- B. Aluminum, Plate and Sheet: ASTM B209/B209M.
- C. Fasteners: Fasteners for securing louvers and louvered vents to adjoining construction, except as otherwise specified or shown, shall be toggle or expansion bolts, of size and type as required for each specific type of installation and service condition.
  - 1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.
  - 2. Fasteners for louvers, louver frames, and wire guards shall be of stainless steel.
- D. Inorganic Zinc Primer: MPI No. 19.

### **2.2 EXTERIOR WALL LOUVERS**

- A. General:
  - 1. Provide fixed type louvers of size and design shown.
  - 2. Heads, sills and jamb sections shall have formed caulking slots or be designed to retain caulking. Head sections shall have exterior drip lip, and sill sections an integral water stop.
  - 3. Furnish louvers with sill extension or separate sill as shown.
  - 4. Frame shall be mechanically fastened or welded construction with welds dressed smooth and flush.
- B. Performance Characteristics:
  - 1. Weather louvers shall have a minimum of 23 percent free area and shall pass 5720 mm/s (1126 fpm) free area velocity at a pressure drop not exceeding 3.8 mm (0.15 inch) water gage and carry not more than 3.1 g (0.01 ounces) of water per m<sup>2</sup> (square foot) of free area for 15 minutes when tested per AMCA Standard 500-L.
  - 2. Louvers shall bear AMCA certified rating seals for air performance and water penetration ratings.
- C. Aluminum Louvers:

1. General: Frames, blades, sills and mullions (sliding interlocking type); airfoil shaped formed 2.1 mm (0.081 inch) aluminum exterior surface with 1 mm (0.040 inch) perforated steel interior surface that covers insulation. Blades positioned at 45 deg. angle and spaced approximately 305 mm (12 inches) center to center. Frames shall be 12" deep, 2.5 mm (0.100 inch) formed aluminum channel.
2. Louvers, fixed: Make frame sizes 13 mm (1/2-inch) smaller than openings. Single louvers frames shall not exceed 1700 mm (66 inches) wide. When openings exceed 1700 mm (66 inches), provide twin louvers separated by mullion members, or as recommended by louver manufacturer.
3. Sound Data: Tested in accordance with ASTM E 90:

Octave Band Frequency (Hz)		2/125	3/250	4/500	5/1000	6/2000	7/4000	8/8000
Free Field Noise Reduction (db)		13	17	18	23	24	23	24
Transmission Loss (db)		7	11	12	17	18	17	18

4. Basis-of-Design Product: Ruskin Model ACL1245AF Acoustical Louver with 12" deep airfoil-shaped blade; or, Airolite; or, COTR's approved equal.
5. Bird Screen:
  - a. With Formed Aluminum Louvers: 19 mm x 1.3 mm (3/4 inch x 0.051 inch) bird screen in removable frame. Screen to add approximately 13 mm (1/2") to louver depth.

### **2.3 CLOSURE ANGLES AND CLOSURE PLATES**

- A. Fabricate from 2 mm (0.074-inch) thick stainless steel.
- B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.
- C. Secure angles and plates to louver frames with screws.

### **2.4 LOUVERED VENTS (AT ROOF OVERBUILDS)**

Fabricate exterior wall vents from galvanized steel in manufacturer's standard gage, based on size of each opening, as indicated on the Drawings.

## **2.5 FINISH**

- A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505
- B. Wall Louvers and Louvered Vents:
  - 1. Powder coat finish: AAMA 2604, to match color of window framing.

## **2.6 PROTECTION**

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous paint (complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.
- B. Protect finished surfaces from damage during fabrication, erection, and after completion of the work. Strippable plastic coating on colored anodized organic finish is not approved.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.
- C. Provide anchoring devices and fasteners as necessary for securing louvers and louver vents to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use.
- D. Generally, set wall louvers in walls during progress of the work. If wall louvers are not delivered to job in time for installation in prepared openings, make provision for later installation. Set in cast-in-place concrete in prepared openings.

### **3.2 CLEANING AND ADJUSTING**

After installation, all exposed prefinished and plated items and all items fabricated from stainless steel shall be cleaned as recommended by

the manufacturer and protected from damage until completion of the project.

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**SECTION 09 06 00**  
**SCHEDULE FOR FINISHES**

**SECTION 09 06 00-SCHEDULE FOR FINISHES**

VAMC: VA Contract #VA 245-P-0617

Location: Martinsburg, WV

Project No. and Name: 613-107 Relocate Dementia Unit

Submission

Date: May 2, 2012

**SECTION 09 06 00**  
**SCHEDULE FOR FINISHES**

**PART I - GENERAL**

**1.1 DESCRIPTION**

This section contains a coordinated system in which requirements for materials specified in other sections shown are identified by abbreviated material names and finish codes in the room finish schedule or shown for other locations.

**1.2 MANUFACTURERS**

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

**1.3 SUBMITALS**

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

**1.4 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.
- B. MASTER PAINTING INSTITUTE: (MPI)  
December, 2010.....Architectural Painting Specification Manual



**PART 2- PRODUCTS**

**2.1 DIVISION 04 - MASONRY**

A. Section 04 05 13, MASONRY MORTARING and Section 04 05 16, MASONRY GROUTING

Finish Code	Manufacturer	Mfg. Color Name
For 8" CMU	---	Grey Mortar
For Synthetic Cast Stone Veneer	---	To be selected by Architect
For Ground Face CMU	---	To be selected by Architect

B. Section 04 20 00, UNIT MASONRY

1.CONCRETE MASONRY UNIT (CMU)				
Type	Size	Pattern	Finish	Mfg. Color Name/No.
CMU Standard	8 x 8 x 16	Running bond	---	---
Ground Face	Per Drawings	Running Bond	Filled and Polished	Bay Block Co., Burnished CMU;or Trendstone by Trenwyth Industries;or COTR approved equal; Color TBD

C. CAST STONE MASONRY (04 72 00)

Stone Type	Color	Manufacturer	Mfg. Color & Texture No.
Synthetic Cast Stone Veneer (AMSMV)	---	Basis-of-Design:Dal-Tile; or Eldorado Stone;or COTR approved equal	Color:Harvest Blend; Pattern: Mesa Ledge Watertable and Sill Texture: Smooth Face

Cast Stone Masonry Fireplace Surrounds		Continental Cast Stone, Designer Collection, Cardiff Square; or COTR approved equal	Smooth Texture; color: TBD
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## 2.2 DIVISION 05 - METALS

### A. SECTION 05 50 00, METAL FABRICATION

Item	Finish
Guard Angles/Channels for Overhead Doors	P
Loose Lintels	P
Steel Ladders	P
Steel Pipe Railings	P

### F. SECTION 05 51 00, METAL STAIRS

Component	Finish	Color
Newel Posts	Paint	TBD
Guard Rails	Paint	TBD
Handrails	Paint	TBD
Stringers	Paint	TBD
Risers	Paint	TBD
Underside	Paint	TBD
Steel Grating Treads and Landing	Paint	TBD

## 2.3 DIVISION 06 WOOD, PLASTICS, AND COMPOSITES

SECTION 06 20 00, FINISH CARPENTRY - For material, species, finish, and color, refer to Drawings

Room No. and Name	Component	Material	Species	Finish	Color
Kitchen Millwork	Countertop				
	Vertical Surface(s)				
	Trim				
	Reveal				
	Handrail				
	Bumper guard				
	Base				
Room No. and Name	Component	Material	Species	Finish	Color
Inter-Disciplinary Office	Countertop				
	Vertical Surface(s)				
	Trim				
	Reveal				
	Handrail				
	Bumper guard				
	Base				
Room No. and Name	Component	Material	Species	Finish	Color
Laundry Room	Countertop				
	Vertical Surface(s)				

	Trim				
	Reveal				
	Handrail				
	Bumper guard				
	Base				
Room No. and Name	Component	Material	Species	Finish	Color
Medical Supply Room (built-in counter and overhead cabinets)	Countertop				
	Vertical Surface(s)				
	Trim				
	Reveal				
	Handrail				
	Bumper guard				
	Base				
Room No. and Name	Component	Material	Species	Finish	Color
Media Wall in Living Room	Countertop				
	Vertical Surface(s)				
	Trim				
	Reveal				
	Handrail				
	Bumper guard				
	Base				
Room No. and	Component	Material	Species	Finish	Color

Name					
Dining Room	Countertop				
	Vertical Surface(s)				
	Trim				
	Reveal				
	Handrail				
	Bumper guard				
	Base				
Room No. and Name	Component	Material	Species	Finish	Color
House Care Office	Countertop				
	Vertical Surface(s)				
	Trim				
	Reveal				
	Handrail				
	Bumper guard				
	Base				
Room No. and Name	Component	Material	Species	Finish	Color
Medication Room	Countertop				
	Vertical Surface(s)				
	Trim				
	Reveal				

	Handrail				
	Bumper guard				
	Base				
Room No. and Name	Component	Material	Species	Finish	Color
BioMed Room	Countertop				
	Vertical Surface(s)				
	Trim				
	Reveal				
	Handrail				
	Bumper guard				
	Base				

VANITIES (TYPES S4, S4 M)		
Room No. and Name	Component	Finish/Color
	Countertop	
	Trim	

THROUGH - WALL COUNTER OR PASS THROUGH COUNTER (TYPE B)		
Room No. and Name	Component	Finish/Color
	Wood Edge	
	Countertop	
	Brackets	

WOOD HANDRAILS	
Room No. and Name	Finish

## 2.4 DIVISION 07 - THERMAL AND MOISTURE PROTECTION

### A. SECTION 07 18 13, PEDESTRIAN TRAFFIC COATINGS

Item	Material	Finish
Balcony waterproofing surfacing system	Basis-of-Design: Dex-O-Tex, Weatherwear; Other Mfr's: Sonneborn, Sonogard Top Coat; Tremco, Vulkem 350 NF/351; or, COTR approved equal	Similar to a broom-finish; Color: to be selected from Manufacturer's standard colors

B. SECTION 07 24 00, EXTERIOR INSULATION AND FINISH SYSTEMS

Finish Code	Finish	Manufacturer	Mfg. Color Name/No.
EIFS 1	Sandblast DPR	Basis-of-Design:Dryvit Systems; Other Mfr's: Sto Corp.; Synergy; or COTR approved equal	Clover 450
EIFS 2	Sandblast DPR	Basis-of-Design:Dryvit Systems; Other Mfr's: Sto Corp.; Synergy; or COTR approved equal	Oyster Shell 456

C. SECTION 07 42 64, METAL-FACED COMPOSITE WALL PANELS

Finish Code	Finish	Manufacturer	Mfg. Color Name/No.
Aluminum Composite Panel	Smooth Skin	Basis-of-Design Product: Reynobond; Other Mfr's: Alucobond; Alpolic; or COTR approved equal	Match Java Brown by Kawneer

D. SECTION 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

Color	Manufacturer	Mfg. Color Name/No.
White	Basis-of-Design: Firestone; Other Mfr's: Carlisle SynTec; GAF; or COTR approved equal	RubberGard



E. SECTION 07 60 00, FLASHING AND SHEET METAL

Item	Material	Finish
Hanging Gutters and Downspouts	Aluminum	Match Sierra Tan by WP Hickman

F. SECTION 07 61 16, SNAP-ON BATTEN STANDING SEAM SHEET METAL ROOFING

Material	Manufacturer	Finish/Color
24 Gauge Galvanized Steel	Basis-of-Design: Firestone, UNA-CLAD UC-1; Other Mfr's: Berridge; Pac Clad; or COTR approved equal	Smooth / Match Sierra Tan by WP Hickman

G. SECTION 07 71 00 / 07 72 00, ROOF SPECIALITIES AND ACCESSORIES

Item	Material	Finish	Manufacturer	Manufacturer/Color Name/Number.
Roof Hatch	Aluminum	Mill	Basis-of-Design Product: Bilco Co.; Other Mfr's: Milcor; Nystrom; or, COTR approved equal	Bilco Type S
Copings	Extruded Aluminum	Paint		Sierra Tan by WP Hickman
Gravel Stops and Fascia System	Extruded Aluminum	Paint		Sierra Tan by WP Hickman

Fascia Systems	Extruded Aluminum	Paint		Sierra Tan by WP Hickman
Roof Expansion Joint Covers	Extruded Aluminum	Mill	Johns-Manville	

H. SECTION 07 92 00, JOINT SEALANTS

Location	Color	Manufacturer	Manufacturer Color
All	TBD	Basis-of-Design: Tremco; Other Mfr's: GE; Pecora; or, COTR approved equal	TBD

I. SECTION 07 95 13, EXPANSION JOINT COVER ASSEMBLIES

	Material	Finish	Manufacturer	Mfg. Color Name/No.
Floor Component Cover Plate Frame Casket or Sealant (interior only)	Aluminum	Clear anodized	Basis-of-Design: Balco Other Mfr's: C/S Group; MM Systems; or COTR approved equal	For model numbers, refer to Spec. Section 07 95 13
Wall Component Cover Plate Frame Casket or Sealant (interior only)	Aluminum with vinyl insert	Clear anodized	Basis-of-Design: Balco Other Mfr's: C/S Group; MM Systems; or COTR approved equal	For model numbers, refer to Spec. Section 07 95 13
Ceiling Component Cover Plate, Gasket or Sealant (interior only)	Aluminum with vinyl insert	Clear anodized	Basis-of-Design: Balco Other Mfr's: C/S Group; MM Systems; or COTR approved equal.	For model numbers, refer to Spec. Section 07 95 13
Exterior Wall Thermoplastic Joint	Open-cell polyurethane foam with silicone facing	---	Colorseal by EMCO	To be selected

## 2.5 DIVISION 08 - OPENINGS

### A. SECTION 08 11 13, HOLLOW METAL DOORS AND FRAMES

Paint both sides of door and frames same color including ferrous metal louvers, and hardware attached to door	
Component	Color of Paint Type and Gloss
Interior Doors and Frames	Sherwin-Williams ProClassic, Alkyd Interior Enamel, Gloss
Exterior Doors and Frames	Sherwin-Williams ProIndustrial Industrial Enamel 100, Gloss

### B. SECTION 08 14 00, WOOD DOORS

Component	Finish/Color
Doors	Stain/TBD
Frames	Stain/TBD

### C. SECTION 08 31 13, ACCESS DOORS AND FRAMES

Material	Finish/Color
Steel	Match color of adjacent finish material, in a satin gloss paint

D. SECTION 08 33 00, COILING DOORS AND GRILLES

Location	Item	Material	Finish	Manufacturer/Model	Manufacturer Color Name/No.
Receiving 267	Door	Galvanized Steel	Thermoset Powder Coating	The Cookson Co., Type FMWI; Other Mfr's: Cornell; Wayne Dalton; or, COTR approved equal	TBD

E. SECTION 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

Material	Finish	Manufacturer	Manufacturer Color Name/No.
Aluminum	Permacoat - Powdercoat	Basis-of-Design Product: Kawneer Trifab 451UT; Other Mfr's: EFCO; Vistawall; or, COTR approved equal	Kawneer: Java Brown
Glass	Clear		

F. SECTION 08 51 13, ALUMINUM WINDOWS

Type	Finish	Glazing	Manufacturer	Mfg. Color Name/No.
Fixed Punched Window Openings	Permacoat - Powdercoat	Clear Insulating	Basis-of-Design Product:Kawneer Trifab 451UT;Other Mfr's: EFCO Series 403(T); Vistawall; or COTR approved equal	Kawneer: Java Brown
Box Windows	Permacoat - Powdercoat	Clear Insulating	Basis-of-Design Product:Kawneer 1600UT System 1;Other Mfr's: EFCO System 5500 (TS);Vistawall;or, COTR approved equal	Kawneer: Java Brown

G. SECTION 08 71 00, BUILDERS HARDWARE

Item	Material	Finish
Hinges		Satin Nickel
Door Closers		Satin Nickel
Closer/ Holder		Satin Nickel
Floor Stops		Satin Nickel
Door Holders		Satin Nickel
Lock/ Latches		Satin Nickel
Key Cabinet	Steel	Painted
Armor Plates	Metal	Satin Nickel
Kick Mop Plates	Metal	Satin Nickel
Exit Device		Satin Nickel
Flush Bolts		Satin Nickel
Door Pulls		Satin Nickel
Push Plates		Satin Nickel
Combination Push Pull Plate		Satin Nickel
Coordinators		Satin Nickel
Light Proof Seals		Satin Nickel
Weather Strip		Satin Nickel
Threshold		Satin Nickel

H. SECTION 08 71 13, AUTOMATIC DOOR OPERATORS

Material	Finish	Manufacturer	Manufacturer Color Name/No.
Aluminum	Permacoat - Powdercoat	Basis-of-Design Product:Besam Swingmaster 900 Full Energy; Other Mfr's:Horton Doors, HD- Swing Series 4800;Stanley Access Technologies, Magic-Force Operator; or,COTR approved equal	To Match Kawneer: Java Brown

I. SECTION 08 90 00, LOUVERS AND VENTS

Item	Material	Finish	Manufacturer	Mfg. Color Name/No.
Wall Louver	Aluminum	Color Anodized	Basis-of-Design: Ruskin Model ACL1245AF Acoustical Louver;Other Mfr's: Airolite Model T9212; Nystrom;or, COTR approved equal	Powder coat to match windows
Wall Vent	Aluminum	Color Anodized	Basis-of-Design: Famco; or, Metallic Products Model MPF-G; or, COTR approved equal	Powder coat to match windows

## 2.6 DIVISION 09 - FINISHES

### A. SECTION 09 30 13, CERAMIC TILING

1. CERAMIC MOSAIC TILE					
Color	Size	Shape	Pattern	Manufacturer	Mfg. Color Name/No.
CT-7	1" x 1"	-	Random	Crossville	4 Colors TBD/Glass Blocks with white setting bed and white grout

2. SECTION 09 30 13, CERAMIC TILING		
Finish Code	Manufacturer	Mfg. Color Name/No
CT-1	Basis-of-Design:Crossville; Other Mfr's: Summitville; DalTile; or, COTR approved equal	Vista Americana, 6" x 18" Plank Tile/ Color: AV 183 Plateau
CT-3/CT-5	Basis-of-Design:Crossville; Other Mfr's: Summitville; DalTile; or, COTR approved equal	Vista Americana, 18" x 18" Large Tile/ Color: AV 181 Dunes
CT-4/CT-6	Basis-of-Design:Crossville; Other Mfr's: Summitville; DalTile; or, COTR approved equal	Vista Americana, 6" x 18" Plank Wall Tile/ Color: AV 181 Dunes
CTB	Basis-of-Design:Crossville; Other Mfr's: Summitville; DalTile; or,	Vista Americana, 6" x 12" Wall Base/ Color: AV 181 Dunes



	COTR approved equal	
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B. SECTION 09 51 00, ACOUSTICAL CEILINGS

Finish Code	Component	Color Pattern	Manufacturer	Mfg Name/No.
AT-1	With 15/16" Suprafine Tee Grid System	White	Basis-of-Design: Armstrong; Other Mfr's: Celotex; USG; or, COTR approved equal	Ultima, Tegular Edge, 24"x24"x3/4"
AT-2	With 15/16" Suprafine Tee Grid System	White	Basis-of-Design: Armstrong; Other Mfr's: Celotex; USG; or, COTR approved equal	Ultima High Washability/Square Edge, 24"x48"x3/4"

C. SECTION 09 65 19, RESILIENT TILE FLOORING

Finish Code	Size	Material/Component	Manufacturer	Mfg Name/No.
RT-1	12" x 12"	VCT	Basis-of-Design: Johnsonite; Other Mfr's: Armstrong; Congoleum; or, COTR approved equal	Johnsonite Melodia/ Color: 609 Navajo CB
RS-1	6' wide sheet w/heat welded seams	Sheet Vinyl	Basis-of-Design: Johnsonite; Other MFR's: Armstrong, Congoleum; or, COTR approved equal	Johnsonite Melodia/Color: 609 Navajo CB

D. SECTION 09 65 16, VINYL SHEET FLOORING, HEAT WELDED SEAMS (WSF)

Finish Code	Pattern name	Manufacturer	Mfg. Color Name/No.
SV-1	Rejuvenations	Basis-of- Design:Armstrong; Other Mfr's: Johnsonite; Congoleum; or, COTR approved equal	Timberline, Acadian Oak, 37372 Oiled Plank
SV-2	Rejuvenations	Basis-of- Design:Armstrong; Other Mfr's: Johnsonite; Congoleum; or, COTR approved equal	Stone Run, Lithos Stone, 34333 Lithos Dunite
SV-3	Rejuvenations	Basis-of- Design:Armstrong; Other Mfr's: Johnsonite; Congoleum; or, COTR approved equal	Timberline Oak, 37360 Bona Fide
SV-4	Rejuvenations	Basis-of- Design:Armstrong; Other Mfr's: Johnsonite; Congoleum; or, COTR approved equal	Ambigu, Origami, 38054 Spellbound

E. SECTION 09 65 13, RESILIENT BASE STAIR TREADS AND ACCESSORIES

Finish Code	Item	Height	Manufacturer	Mfg Name/No.
RB-1	Rubber Base (RB)	6"	Basis-of-Design: Johnsonite; Other Mfr's: Flexco; Roppe; or, COTR approved equal	Johnsonite Millwork Wall Finishing System: Profile: Inflection/ Color: 45 Sandalwood WB
RB-2	Rubber Base (RB)	4"	Basis-of-Design: Johnsonite; Other Mfr's: Flexco; Roppe; or, COTR approved equal	Johnsonite Millwork Wall Finishing System: Profile: Silhouette/ Color: 45 Sandalwood WB
RB-3	Rubber Base (RB)	4"	Basis-of-Design: Johnsonite; Other Mfr's: Flexco; Roppe; or, COTR approved equal	Johnsonite Traditional Cove Base System WA-XX: Profile: Standard/ Color: 01 Snow White
-	Resilient Stair Treads (RST)	-	Basis-of-Design: Johnsonite; Other Mfr's: Flexco; Roppe; or, COTR approved equal	Johnsonite Rubber Stair Tread/Riser Combination/Color: 45 Sandalwood

F. SECTION 09 68 00, CARPET (CP)

Finish Code	Pattern	Manufacture	Mfg. Color Name/No.
CP-1	Aegea	Atlas Carpet Mills; Other Mfr's: Tandus; DesignWeave; or, COTR approved equal	Mediterranea Collection/ Color: 5307 Delicate Gold

1. SECTION 09 68 00, CARPET EDGE STRIP

Finish Code	Material	Manufacturer	Mfg. Color Name/No.
-	Vinyl	Basis-of-Design: Johnsonite; Other Mfr's: Flexco; Roppe; or, COTR approved equal	Slim Line Transition, SLT-XX-H/ Color: 45 Sandalwood

G. SECTION 09 68 00, CARPET MODULES - MODULAR WALK-OFF MAT (WOM)

Finish Code	Size	Pattern direction	Manufacturer	Mfg. Color Name/No.
WOM-1	18" x 18" x 1/4"	TBD	Mats, Inc.; Other Mfr's: Milliken; Mannington; or, COTR approved equal	Charcoal/Geo Tile

H. SECTION 09 91 00, PAINT AND COATINGS

1. MPI Gloss and Sheen Standards

		Gloss @60	Sheen @85
Gloss Level 1	a traditional matte finish-flat	max 5 units, and	max 10 units
Gloss Level 2	a high side sheen flat-"a velvet-like" finish	max 10 units, and	10-35 units
Gloss Level 3	a traditional "egg-shell like" finish	10-25 units, and	10-35 units
Gloss Level 4	a "satin-like" finish	20-35 units, and	min. 35 units
Gloss Level 5	a traditional semi-gloss	35-70 units	
Gloss Level 6	a traditional gloss	70-85 units	
Gloss level 7	a high gloss	more than 85 units	

2. Paint code	Gloss	Manufacturer	Mfg. Color Name/No.
P1 (ceilings)	1 (Latex)	S-W	Alabaster/SW 7008
P2 (general walls)	3 (Latex)	S-W	Shoji White/SW 7042
P3 (HM doors)	5 (Alkyd)	S-W	Sand Bar/SW SW 7547
P4 (HM door frames)	5 (Alkyd)	S-W	Rookwood Brown/SW 2806
P5 (Resident bedroom wall of bathroom)	3 (Latex)	S-W	Adaptive Shade/SW 7053
P156 (Corridor 156 accent wall)	3 (Latex)	S-W	Beguiling Mauve/SW 6269
P161 (Elevator Lobby 161 accent wall)	3 (Latex)	S-W	Ecru/SW 6135
P256 (Corridor 256 accent wall)	3 (Latex)	S-W	Beguiling Mauve/SW 6269

P261(Elevator Lobby 261 accent wall)	3 (Latex)	S-W	Ecru/SW 6135
PS-1(Stairs: handrails, stringers, risers)	5 (Alkyd)	S-W	Popular Gray/SW 7547
3. Stain Code (S)	Gloss and Transparency	Manufacturer	Mfg. Color Name/No.
	Semi-Transparent		
S-1	4	To match KraftMaid stain color	Cherry in Sunset
S-2	4	S-W	Banister Beige/SW 3128-0

## 2.7 DIVISION 10 - SPECIALTIES

### A. SECTION 10 13 00 / 10 14 00, INTERIOR SIGNS

Sign Type	Component	Manufacturer	Mfg. Color Name/No.
Interior Toilet Rooms		Basis-of-Design: ASI Signage; Other Mfr's: Allen Industries; Matthews International;or, COTR approved equal	TBD
Interior Room Identification Signs, Room Numbers Only		Basis-of-Design: ASI Signage; Other Mfr's: Allen Industries; Matthews International;or, COTR approved equal	TBD
Interior Room Identification Signs, Room		Basis-of-Design: ASI Signage; Other	TBD

Numbers and Function		Mfr's: Allen Industries; Matthews International; or, COTR approved equal	
"Do Not Use Elevator" Sign		Basis-of-Design: ASI Signage; Other Mfr's: Allen Industries; Matthews International; or, COTR approved equal	TBD

B. SECTION 10 21 23, CUBICLE CURTAIN TRACKS

Finish Code	Manufacturer	Mfg. Color Name/No.
6000 Series	Basis-of-Design: Diamond Drapery; Other Mfr's: C/S Group; Ocelco; or, COTR approved equal	Clear Anodic

C. SECTION 10 25 13, PATIENT BED SERVICE WALLS

Component	Material	Finish	Manufacturer	Mfg. Color/Name
Cabinet Frame			Amico 3-Gas Back-to-Back Artwall System	

D. SECTION 10 26 00, WALL GUARDS AND CORNER GUARDS

Item	Material	Manufacturer	Mfg. Color Name/No.
Corner Guards	Rigid Vinyl	Basis-of-Design: AFco; Other Mfr's: C/S Group: Korogard; or, COTR approved equal	Andromeda Corner Guard
Wall Guards and Handrail	PVC	Basis-of-Design: AFco; Other Mfr's: C/S Group: Korogard; or, COTR approved equal	Thunderbird Handrail
Wall Guard	PVC	Basis-of-Design: AFco; Other Mfr's: C/S Group: Korogard; or, COTR approved equal	Presidential Handrail
AC-1 Wall Protection	PVC	Basis-of-Design: C/S Group; Other Mfr's: Afco;Korogard; or, COTR approved eqaul	Acrovyn 4000/Color: TBD
AC-2 Wall Protection	PVC	Basis-of-Design: C/S Group; Other Mfr's: Afco;Korogard; or, COTR approved eqaul	Acrovyn 4000/Color: TBD
AC-3 Wall Protection	PVC	Basis-of-Design: C/S Group; Other Mfr's: Afco;Korogard; or, COTR approved eqaul	Acrovyn 4000/Color: 101 French Cream



E. SECTION 10 28 00, TOILET AND BATH ACCESSORIES

Item	Material	Manufacturer	Mfg. Color Name/No.
Toilet Paper Dispenser: Side by Side Double Roll Bathroom Dispenser		Georgia Pacific	Model No. 56784
Paper Towel Holder: Sofpull Translucent Smoke Dispenser, Center Pull		Georgia Pacific	Model No. 58204, Size: 11.5"x9.25"x8.75", for Rolls 7.8"x15"
Soap Dispenser: Bacti-Foam Soap dispenser, for Bacti-Foam Soap		Ecolab	Model No. 92723188
Shower Transfer Bench		Carex	Product Size: Top of Back: 29-3/4"w x 19"d x 33"h
Shower Grab Bars	Steel	Gamco; or, ASI; or, COTR approved equal	Powder Coated White/ Model 150 Series Straight (one at 18" and one at 48" for each shower area)
Swing Up Grab Bar with Integral Toilet Paper Holder	Satin Stainless Steel	Gamco; or, ASI; or, COTR approved equal	Model 125TPH
Swing Up Grab Bar	Satin Stainless Steel	Gamco; or, ASI; or, COTR approved equal	Model 125
Double Robe Hook	Satin Stainless Steel	Bobrick; or, ASI; or, COTR approved equal	Model B-6727
Surface-Mounted Towel Bar	Satin Stainless Steel	Bobrick; or, ASI; or, COTR approved equal	Model B-6737
Recessed Medicine Cabinet	Steel with Baked-Enamel Finish	Bobrick; or, ASI; or, COTR approved equal	White/ Model No. B-397

Shelf with Mop and Broom Holders	Stainless Steel	Bobrick; or, ASI; or, COTR approved equal	Model B-224
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F. SECTION 10 44 13, FIRE EXTINGUISHER CABINETS

Component	Material	Finish
Door Trim	Baked-on Enamel Prime Coat	Satin Finish, color to be selected by Architect

G. SECTION 10 51 00, LOCKERS

MANUFACTURER	COLOR
Basis-of-Design: Spec-Rite Designs; Other Mfr's: Ideal Products; Holman Lockers; or, COTR approved equal	To be selected from Manufacturer's standard colors

**2.8 DIVISION 11 - EQUIPMENT**

A. SECTION 11 41 00, FOOD SERVICE SELF CONTAINED REFRIGERATION EQUIPMENT

Component	Material	Finish	Manufacturer	Mfg. Color Name/No.
Refrigerators, Mechanical, Food, Self Contained, Reach-in, Roll- in, Pass Through	Outer Shell	Stainless Steel		---
	Doors	Stainless Steel		---
	Loading Cart			
	Transfer Carriage			

## 2.9 DIVISION 12- FURNISHINGS

### A. SECTION 12 24 00, WINDOW SHADES

Component	Material	Manufacturer	Mfg. Color Name/No.
Roller Window Shades	Semi-Opaque, Vinyl-Coated, Polyester Core	Basis-of-Design:2100 Series MechoShade; Other Mfr's: Hunter Douglas; Draper; or, COTR approved equal	Eggshell/2116
Venetian Blinds	PVC-Free Plastic	Basis-of-Design: Hunter Douglas; Other Mfr's:Levelor; Kirsch; or, COTR approved equal	Hunter Douglas:Faux Wood, EverWood/TBD; Levelor: Faux Wood Blinds; Kirsch: Resemblance

### B. SECTION 12 35 70.21, MEDICATION CABINET

Component	Material	Manufacturer	Mfg. Color Name/No.
Door & Cabinet	Acrylic Plastic	Cygnus, Inc.	Wood Grain

### C. SECTION 12 32 00, WOOD CASEWORK

Item Type	Location	Finish/Color
All Cabinetry; basis-of-Design: KraftMaid; Other Mfr's: Merillat; Thomasville Cabinetry; or, COTR approved equal	Kitchen and Servery Rooms 131 and 231	Door Profile: Square Recessed Panel Veneer (SNC) Finish: Sunset on Cherry Hardware: Antique Nickel Federal Pull (item #7160.AN)

D. SECTION 12 36 00, COUNTERTOPS AND ACCESSORIES

Type	Finish/Color
Quartz Composite QC-1	Basis-of-Design: Zodiaq by DuPont: Mossy Green; Other Mfr's: Caesarstone; or, COTR approved equal/ 3 cm thickness
Solid Polymer Molded Resin SS-2	Corian: Aurora/ 2 cm thickness

**2.9 DIVISION 13- SPECIAL CONSTRUCTION**

A. SECTION 13 17 00, PRE-FABRICATED FIREPLACE

Item/Manufacturer	Materials	Finish
Pre-Fabricated Fireplace/ Basis-of-Design: Opti-Flame, Built-in Purefire Firebox BF39; Other Mfr's: Lennox Hearth Products, Merit Plus, MPE-36R;Majestic Products, Alura-Fire, WEF36;or, COTR approved equal	Glass door	Cabinet: Flat Wall - White
	Wall-mounted thermostat	
	Built-in manual switches	

## 2.10 DIVISION 14 - CONVEYING EQUIPMENT

### A. SECTION 14 24 00, HYDRAULIC ELEVATORS

1. Passenger Elevator No. 1 and No. 2	Component	Material	Color
	Hoistway Entrances	Stainless Steel	
	Hoistway Doors	Stainless Steel	
	Corridor Position Indicator	Stainless Steel	
	Car Canopy	Brushed Alum. Panels w/ Downlights	
	Car Wainscot	PLam, Alum Reveals w/ Wood Grain to Match PLam Millwork	
	Panels Above Wainscot	PLam, Alum Reveals w/ Wood Grain to Match PLam Millwork	
	Car Floor	Sheet Vinyl (SV-1)to Match Adjacent Vestibules	
	Corridor Call Buttons	Stainless Steel	
	Car Doors	Stainless Steel	
	Car Door Frame	Stainless Steel	
	Corridor Position Indicator	Stainless Steel	
	Car Operating Panel	Stainless Steel	
	Car Base	Stainless Steel	
	Car Handrail	Round Stainless Steel	

## 2.12 DIVISION 22 - PLUMBING

A. SECTION 22 40 00, PLUMBING FIXTURES AND TRIM - Refer to Section 22 40 00 Plumbing Fixtures

Item	Color
Water Closet	White
Urinal	White
Bathtubs	White
Lavatories	White
Service Sink Corner	White
Service Sink	White
Clinic Service Sink	White

## 2.13 DIVISION 26 - ELECTRICAL

A. SECTION 26 51 00, INTERIOR LIGHTING - Refer to Fixture Schedule on Electrical Drawings

B. SECTION 26 56 00, EXTERIOR LIGHTING - Refer to Fixture Schedule on Electrical Drawings

## 2.14 DIVISION 32 - EXTERIOR IMPROVEMENTS

A. SECTION 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

Color	Finish	Manufacturer	Mfg. Color Name/No.
Color A	As indicated on the drawings	L.M. Schofield; Davis Colors; Solomon Colors	To be selected by Architect from manufacturer's full range. Submit samples for selection.

Color B	As indicated on the drawings	L.M. Schofield; Davis Colors; Solomon Colors	To be selected by Architect from manufacturer's full range. Submit samples for selection.
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B. Section 32 31 53, PERIMETER SECURITY FENCES & GATES

Finish Pickets	Finish Posts and Rails	Manufacturer	Mfg. Color Name/No.
Powder Coated	Powder Coated	Ameristar; Master Halco; Iron World Mfg.	Black

C. SECTION 32 17 23, PAVEMENT MARKINGS.

Color	Manufacturer	MFG. Color Name/No.
Yellow	----	----

D. SITE AND STREET FURNISHINGS (Government Furnished and Contractor Installed (GFCI)

Item	Style Name/No.	Finish	Manufacturer	Mfg. Color Name/No.
Rocker	Wellspring Rocker	Untreated	Landscape Forms	Teak
Chair with Arms	Wellspring Chair	Untreated	Landscape Forms	Teak
Dining Table	Wellspring Dining Table	Untreated	Landscape Forms	Teak
Side Table	Wellspring side Table	Untreated	Landscape Forms	Teak

24" High Planter	Village Collection VS-2400 with Saucer and CWC- 1500 Irrigation Insert	FRP	Tournesol Siteworks	Metal-Infused Iron
30" High Planter	Village Collection VS-2400 with Saucer and CWC- 1500 Irrigation Insert	FRP	Tournesol Siteworks	Metal-Infused Iron
Trash Receptacles	Wellspring Litter Receptacle	Untreated	Landscape Forms	Teak

### PART III EXECUTION

#### 3.1 FINISH SCHEDULES & MISCELLANEOUS ABBREVIATIONS

FINISH SCHEDULE & MISCELLANEOUS ABBREVIATIONS	
Term	Abbreviation
Anodized Aluminum Colored	AAC
Anodized Aluminum Natural Finish	AA
Baked On Enamel	BE
Carpet	CP
Ceramic Tile Base (coved)	CTB

Ceramic Tile	CT
Concrete	C
Concrete Masonry Unit	CMU
Existing	E
Exterior	EXT
Exterior Finish System	EFS
Exterior Paint	EXT-P
Granite	GT
Gypsum Wallboard	GWB
Material	MAT
Mortar	M
Paint	P
Porcelain Paver Tile	PPT



Quartz Composite	QC
Radiant Ceiling Panel System	RCP
Rubber Stair Tread	RST
Resilient Base	RB
Resilient Tile Flooring	RT
Stain	S

Sealed Concrete	SC
Walk-Off Matt	WOM
Sheet Vinyl (heat welded seams)	SV
Wood	WD

### 3.2 FINISH SCHEDULE SYMBOLS

#### Symbol Definition

\*\* Same finish as adjoining walls  
 - No color required  
 E Existing  
 XX To match existing  
 EFTR Existing finish to remain  
 RM Remove

#### Remarks Legend

- 1 Hollow metal door paint: P3
- 2 Hollow metal door frame paint: P4
- 3 Wood door stain: S-2
- 4 Wood door frame/trim stain: S-2
- 5 CT-1 accent tile: Stripe on wall at shower - refer to elevations
- 6 Paint finish on metal stair components: PS-1
- 7 6" high millwork wall base: RB-1
- 8 Typical wall paint color: P 2
- 9 Typical ceiling paint color: P 1
- 10 Acoustic tile, 2 x 2: AT-1

### 3.3 ROOM FINISH SCHEDULE

A. Match adjoining or existing similar surfaces colors, textures or patterns where disturbed or damaged by alterations or new work when not scheduled.

#### B. ROOM FINISH SCHEDULE

#### FIRST FLOOR

Room No. and Name		FLOOR			BASE		WALL		WAINSCOT		CEILING		REMARKS
100 FOYER	N E W	MAT WOM 1	FC		MAT	FCC	MAT	FCC	MAT	FC	MAT	FCC	
				N	RB 1		P 2		---		GWB-P1		3, 4
				E	RB 1		P 2		---				
				S	RB 1		P 2		---				
				W	RB 1		P 2		---				
				C									
101 QUIET ROOM	N E W	CPT 1		N	RB 2		P 2		---		GWB-P1 / AT 1		3, 4
				E	RB 2		P 2		---				
				S	RB 2		P 2		---				
				W	RB 2		P 2		---				
				C									
102 BATHING SUITE	N E W	CT 1		N							GWB-P1 / AT 2		
				N	CTB		P 2 / CT- 3/4		---				

				E	CTB		P 2		---		GWB-P1	
				S	CTB		P 2 / CT- 3/4		---			
				W	CTB		P 2		---			
103 TOILET	N E W	CT 1		N	CTB		P 2		CT-3		GWB-P1 / AT 1	3, 4
				E	CTB		P 2		CT-3			
				S	CTB		CT- 3/4		---			
				W	CTB		P 2		CT-3			
				C								
104 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC 1		GWB-P1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
105 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		P 2 / CT5		CT-5			
				S	CTB		CT5/6		---			
				W	CTB		CT5/6		---			
				C								
106 BARIA-	N	SV 4		N	RB 2		P 2		---		GWB-P1 / 	3, 4
				E	RB 2		P 2		---			

TRIC BEDROOM	E W			S	RB 2		P 5		AC-1		AT 1	
				W	RB 2		P 2		---			
				C								
107 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		P 2 / CT5		CT-5			
				S	CTB		CT5/6		---			
				W	CTB		CT5/6		---			
				C								
108 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 5		AC-1			
				C								

109 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		CT5/6		---			
				W	CTB		P 2 / CT5		CT-5			
				C								
110		SV 4		N	RB 2		P 2		---		GWB-P1	3, 4

RESIDENT BEDROOM	N E W			E	RB 2		P 5		AC-1		/ AT 1	
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
111 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		P 2 / CT5		CT-5			
				S	CTB		CT5/6		---			
				W	CTB		CT5/6		---			
				C								
112 RESIDENT BEDROOM	N E W	SV 4		N	RB 1		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 1		P 2		---			
				S	RB 1		P 2		---			
				W	RB 1		P 5		AC-1			
				C								

113 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		CT5/6		---			
				W	CTB		P 2 / CT5		CT-5			
				C								
114		SV 4		N	RB 2		P 2		---		GWB-P1	3, 4

RESIDENT BEDROOM	N E W			E	RB 2		P 2		---		/ AT 1	
				S	RB 2		P 5		AC-1			
				W	RB 2		P 2		---			
				C								
115 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		CT5/6		---			
				W	CTB		P 2 / CT5		CT-5			
				C								
116 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								

117 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		CT5/6		---			
				W	CTB		P 2 / CT5		CT-5			
				C								
118		SV 4		N	RB 2		P 2		---		GWB-P1	3, 4

RESIDENT BEDROOM	N E W			E	RB 2		P 2		---		/ AT 1	
				S	RB 2		P 5		AC-1			
				W	RB 2		P 2		---			
				C								
119 GENERAL BATHROOM	N E W	CT 1		N	CTB		CT5/6		---		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		P 2 / CT5		CT-5			
				W	CTB		P 2 / CT5		CT-5			
				C								
120 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								

121 GENERAL BATHROOM	N E W	CT 1		N	CTB		CT5/6		---		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		P 2 / CT5		CT-5			
				W	CTB		P 2 / CT5		CT-5			
				C								
122		CP 1		N	RB 2		P 2		---		AT 1	3, 4

HOUSE CARE WS	N E W			E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
123 MEDICAL ROOM	N E W	CT 1		N	CTB		P 2		---		GWB-P1	1, 2
				E	CTB		P 2		---			
				S	CTB		P 2		---			
				W	CTB		P 2		---			
				C								
124 EQUIP- MENT STORAGE	N E W	RT 1		N	RB 3		P 2		---		GWB-P1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								

125 ELECTRIC ROOM	N E W	RT 1		N	RB 3		P 2		---		GWB-P1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
126 TOILET	N E	SV 1		N	RB 1		P 2		---		GWB-P1	3, 4
				E	RB 1		P 2		---			
				S	RB 1		P 2		---			



	W			W	RB 1		P 2		---			
				C								
127 COAT CLOSET	N E W	SV-1		N	RB 2		P 2		---		GWB-P1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
128 LIVING ROOM	N E W	SV 1		N	RB 1/2		P 2		---		GWB-P1	
				E	-		-		---			
				S	RB 1		P 2		---			
				W	RB 1		P 2		---			
				C								
129 BREAK- FAST NOOK	N E W	SV 2		N	-		-		---		GWB-P1 / ST-3	
				E	-		-		---			
				S	RB 1		P 2		---			
				W	RB 1		P 2		---			
				C								
130 DINING ROOM	N E W	SV 2		N	RB 1/2		P 2		---		GWB P1	
				E	RB 1		P 2		---			
				S	-		-		---			
				W	-		-					
				C								
131 KITCHEN	N	SV 2		N	RB 1/2		P 2		---		GWB-P1	
				E	RB 1/2		P 2		---			

& SERVERY	E W			S	RB 1/2		P 2		---			
				W	RB 1/2		P 2		---			
				C								
132 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
133 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		P 2 / CT5		CT-5			
				S	CTB		CT5/6		---			
				W	CTB		CT5/6		---			
				C								

134 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 5		AC-1			
				W	RB 2		P 2		---			
				C								
135 GENERAL BATHROOM	N E W	CT 1		N	CTB		CT5/6		---		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		P 2 / CT5		CT-5			

				W	CTB		P 2 / CT5		CT-5			
				C								
136 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
137 GENERAL BATHROOM	N E W	CT 1		N	CTB		CT5/6		---		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		P 2 / CT5		CT-5			
				W	CTB		P 2 / CT5		CT-5			
				C								

138 LAUNDRY	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
139 CLEAN LINEN	N E W	SV 1		N	RB 2		P 2		---		GWB-P1	1, 2
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			

				C								
140 CORRIDOR	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
141 HAC	N E W	SV 2		N	RB 3		P 2		---		AT 2	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
142 SOILED UTILITY	N E W	SV 2		N	RB 3		P 2		---		AT 2	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
143 STAFF TOILET	N E W	CT 1		N	CTB		P 2		---		AT 1	1, 2
				E	CTB		P 2		---			
				S	CTB		P 2		---			
				W	CTB		P 2		---			
				C								
144 MEDICAL SUPPLY	N E	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			

ROOM	W			W	RB 3		P 2		---			
				C								
145 COMMUNI- CATION CLOSET	N E W	RT 1		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
146 RECREATI ONAL STORAGE	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
147 INTER- DISCI- PLINARY OFFICE	N E W	CP 1		N	RB 2		P 2		---		AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
148 STRET- CHER STORAGE	N E W	RT 1		N	RB 3		P 2		---		AT 1	
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
149 RECYCL-	N	SC		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			

ING / TRASH	E W			S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
150 MECHANI- CAL ROOM	N E W	SC		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
151 EMR	N E W	SC		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								

152 POLICE TACK ROOM	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
153 CORRIDOR	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								

154 OFFICE	N E W	CP 1		N	RB 2		P 2		---		AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
155 PANTRY	N E W	SV 2		N	RB 3		P 2		---		GWB-P1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
156 CORRIDOR	N E W	SV-1		N	RB 1		P 2		---		AT 1	1, 2, 3, 4
				E	RB 1		P 2		AC-1			
				S	RB 1		P 2		---			
				W	RB 1		P 2 / P 156		AC-1			
				C								
157 CORRIDOR	N E W	SV 1		N	RB 1		P 2		AC-1		GWB-P1 / AT 1	1, 2, 3, 4
				E	RB 1		P 2		AC-1			
				S	RB 1		P 2		AC-1			
				W	RB 1		P 2		AC-1			
				C								
158 CORRIDOR	N E W			N	RB 1		P 2		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 1		P 2		AC-1			
				S	RB 1		P 2		AC-1			
				W	RB 1		P 2		AC-1			

				C							
159 CORRIDOR	N E W			N	RB 1		P 2		AC-1	GWB-P1 / AT 1	3, 4
				E	RB 1		P 2		AC-1		
				S	RB 1		P 2		AC-1		
				W	RB 1		P 2		AC-1		
				C							
160 ALCOVE	N E W			N	RB 1		P 2		AC-1	GWB-P1 / AT 1	3, 4
				E	RB 1		P 2		AC-1		
				S	RB 1		P 2		AC-1		
				W	RB 1		P 2		AC-1		
				C							
161 VESTI- BULE	N E W	SV-1		N	RB 1		P 2		---	GWB-P1 / ST-3	
				E	RB 1		P 2		---		1, 2
				S	RB 1		P161		---		
				W	RB 1		P 2		---		
				C							
162 LOBBY	N E W	WOM 1		N	RB 1		P 2		---	GWB-P1 / AT 1	
				E	RB 1		P 2		---		
				S	RB 1		P 2		---		
				W	RB 1		P 2		---		
				C							
163 CLOSET	N E	CP 1		N	RB 2		P 2		---	GWB-P1	3, 4
				E	RB 2		P 2		---		
				S	RB 2		P 2		---		



	W			W	RB 2		P 2		---			
				C								
171 MAIN ELECTRIC ROOM	N E W	SC		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
172 SWITCH- GEAR ROOM	N E W	SC		N	RB 3		P 2		---		EXP	
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
173 EMER- GENCY GENERA- TOR ROOM	N E W	SC		N	RB 3		P 2		---		EXP	
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								

SECOND FLOOR

200 FOYER (LOBBY)	N E W	CP 1		N	RB 1		P 2		---		GWB-P1	3, 4
				E	RB 1		P 2		---			
				S	RB 1		P 2		---			
				W	RB 1		P 2		---			
				C								

201 QUIET ROOM	N E W	CP 1		N	RB 2		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
202 BATHING SUITE	N E W	CT 1		N	CTB		P 2 / CT- 3/4		---		GWB-P1 / AT 2	3, 4
				E	CTB		P 2		---			
				S	CTB		P 2 / CT- 3/4		---			
				W	CTB		P2		---			
				C								

203 TOILET	N E W	CT 1		N	CTB		P 2		CT-3		GWB-P1	
				E	CTB		P 2		CT-3			
				S	CTB		CT- 3/4		---			
				W	CTB		P2		CT-3			
				C								
204 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								

205 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		P 2 / CT5		CT-5			
				S	CTB		CT5/6		---			
				W	CTB		CT5/6		---			
				C								
206 BARIAT- RIC BEDROOM	N E W	SV 4		N	RB 2		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 5		AC-1			
				W	RB 2		P 2		---			
				C								

207 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		P 2 / CT5		CT-5			
				S	CTB		CT5/6		---			
				W	CTB		CT5/6		---			
				C								
208 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 5		AC-1			

				C								
209 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		CT5/6		---			
				W	CTB		P 2 / CT5		CT-5			
				C								
210 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 2		P 5		AC-1			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								

211 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		P 2 / CT5		CT-5			
				S	CTB		CT5/6		---			
				W	CTB		CT5/6		---			
				C								
212 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 2		---		GWB-P1 / AT 1	
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 5		AC-1			

				C			P 2					
213 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		CT5/6		---			
				W	CTB		P 2 / CT5		CT-5			
				C								
214 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 5		AC-1			
				W	RB 2		P 2		---			
				C								

215 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		CT5/6		---			
				W	CTB		P 2 / CT5		CT-5			
				C								
216 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			

				C								
217 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		CT5/6		---			
				W	CTB		P 2 / CT5		CT-5			
				C								
218 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 5		AC-1			
				W	RB 2		P 2		---			
				C								

219 GENERAL BATHROOM	N E W	CT 1		N	CTB		CT5/6		---		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		P 2 / CT5		CT-5			
				W	CTB		P 2 / CT5		CT-5			
				C								
220 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			

				C								
221 GENERAL BATHROOM	N E W	CT 1		N	CTB		CT5/6		---		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		P 2 / CT5		CT-5			
				W	CTB		P 2 / CT5		CT-5			
				C								
222 HOUSE CARE WS	N E W	CP 1		N	RB 2		P 2		---		AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								

223 MEDICAL ROOM	N E W	CT 1		N	CTB		P 2		---		GWB-P1	1, 2
				E	CTB		P 2		---			
				S	CTB		P 2		---			
				W	CTB		P 2		---			
				C								
224 EQUIP- MENT STORAGE ROOM	N E W	RT 1		N	RB 3		P 2		---		GWB-P1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
225		RT 1		N	RB 3		P 2		---		GWB-P1	1, 2

ELECTRIC ROOM	NEW			E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
226 TOILET	NEW	SV 1		N	RB 1		P 2		---		GWB-P1	3, 4
				E	RB 1		P 2		---			
				S	RB 1		P 2		---			
				W	RB 1		P 2		---			
				C								
227 COAT CLOSET	NEW	CP 1		N	RB 2		P 2		---		GWB-P1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
228 LIVING ROOM	NEW	SV 1		N	RB 1/2		P 2		---		GWB-P1	
				E	-		-		---			
				S	RB 1		P 2		---			
				W	RB 1		P 2		---			
				C								
229 BREAK-FAST NOOK	NEW	SV 2		N	-		-		---		GWB-P1 / ST-3	
				E	-		-		---			
				S	RB 1		P 2		---			
				W	RB 1		P 2		---			
				C								



230 DINING ROOM	N E W	SV 2		N	RB 1/2		P 2		---		GWB-P1	
				E	RB 1		P 2		---			
				S	-		-		---			
				W	-		-		---			
				C								
231 KITCHEN & SERVERY	N E W	SV 2		N	RB 1/2		P 2		---		GWB-P1	
				E	RB 1/2		P 2		---			
				S	RB 1/2		P 2		---			
				W	RB 1/2		P 2		---			
				C								

232 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
233 GENERAL BATHROOM	N E W	CT 1		N	CTB		P 2 / CT5		CT-5		GWB-P1	3, 4, 5
				E	CTB		P 2 / CT5		CT-5			
				S	CTB		CT5/6		---			
				W	CTB		CT5/6		---			
				C								

234 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 2		---		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 5		AC-1			
				W	RB 2		P 2		---			
				C								
235 GENERAL BATHROOM	N E W	CT 1		N	CTB		CT5/6		---		GWB-P1	
				E	CTB		CT5/6		---			
				S	CTB		CT5/6		CT-5			3, 4, 5
				W	CTB		CT5/6		CT-5			
				C								

236 RESIDENT BEDROOM	N E W	SV 4		N	RB 2		P 5		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
237 GENERAL BATHROOM	N E W	CT 1		N	CTB		CT5/6		---		GWB-P1	3, 4, 5
				E	CTB		CT5/6		---			
				S	CTB		P 2 / CT5		CT-5			
				W	CTB		P 2 / CT5		CT-5			
				C								

238 LAUNDRY	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
239 CLEAN LINEN	N E W	SV 1		N	RB 2		P 2		---		GWB-P1	1, 2
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								

240 CORRIDOR	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
241 HAC	N E W	SV 2		N	RB 3		P 2		---		AT 2	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
242 SOILED	N	SV 2		N	RB 3		P 2		---		AT 2	1, 2
				E	RB 3		P 2		---			

UTILITY	E W			S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
243 STAFF TOILET	N E W	CT 1		N	CTB		P 2		---		AT 1	1, 2
				E	CTB		P 2		---			
				S	CTB		P 2		---			
				W	CTB		P 2		---			
				C								
244 MEDICAL SUPPLY	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
245 OXYGEN STORAGE	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
246 COMMUNI- CATION CLOSET	N E W	RT 1		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
247		CP 1		N	RB 2		P 2		---		AT 1	3, 4

INTER-DISCIPLINARY OFFICE	NEW			E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
248 BIOMED	NEW	RT 1		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								

249 RECYCLING / TRASH	NEW	SC		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
250 ELEC ROOM	NEW	SC		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
253 OFFICE	NEW	CP1		N	RB 2		P 2		---		AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			

	W			W	RB 2		P 2		---			
				C								
255 PANTRY	N E W	SV 2		N	RB 3		P 2		---		GWB-P1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
256 CORRIDOR	N E W	SV-1		N	RB 1		P 2		---		AT 1	1, 2, 3, 4
				E	RB 1		P 2		AC-1			CP-1 to occur at entrance doors to Public Corridor 264
				S	RB 1		P 2		---			
				W	RB 1		P 2 / P 256		AC-1			
				C								
257 CORRIDOR	N E W	SV 1		N	RB 1		P 2		AC-1		GWB-P1 / AT 1	1, 2, 3, 4
				E	RB 1		P 2		AC-1			
				S	RB 1		P 2		AC-1			
				W	RB 1		P 2		AC-1			
				C								
258 CORRIDOR	N E W	SV 1		N	RB 1		P 2		AC-1		GWB-P1 / AT 1	
				E	RB 1		P 2		AC-1			
				S	RB 1		P 2		AC-1			
				W	RB 1		P 2		AC-1			
				C								

259 CORRIDOR	N E W	SV 1		N	RB 1		P 2		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 1		P 2		AC-1			
				S	RB 1		P 2		AC-1			
				W	RB 1		P 2		AC-1			
				C								
260 ALCOVE	N E W	SV 2		N	RB 1		P 2		AC-1		GWB-P1 / AT 1	3, 4
				E	RB 1		P 2		AC-1			
				S	RB 1		P 2		AC-1			
				W	RB 1		P 2		AC-1			
				C								

261 ELEVATOR VESTI- BULE	N E W	SV-1		N	RB 1		P 2		---		GWB-P1 / ST-3	3, 4
				E	RB 1		P 2		---			
				S	RB 1		P 261		---			
				W	RB 1		P 2		---			
				C								
262 EDUCA- TION ROOM	N E W	CP 1		N	RB 2		P 2		---		AT 1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
263 SERVICE	N	SC		N	RB 3		P 2		AC-1		EXP	1, 2
				E	RB 3		P 2		---			

CORRIDOR	E W			S	RB 3		P 2		AC-1			
				W	RB 3		P 2		---			
				C								
264 PUBLIC CORRIDOR	N E W	CP-1		N	RB 1		P 2		AC-1		AT 1	1, 2
				E	RB 1		P 2		---			
				S	RB 1		P 2		AC-1			
				W	RB 1		P 2		---			
				C								
266 MULE STORAGE	N E W	SC		N	RB 3		P 2		AC-1		AT 1	
				E	RB 3		P 2		AC-1			
				S	RB 3		P 2		AC-1			
				W	RB 3		P 2		AC-1			
				C								
268 CLOSET	N E W	CP 1		N	RB 2		P 2		---		GWB-P1	3, 4
				E	RB 2		P 2		---			
				S	RB 2		P 2		---			
				W	RB 2		P 2		---			
				C								
267 RECEIV- ING	N E W	SC		N	RB 3		P 2		---		EXP	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								



**501C BUILDING**

301 501 LOBBY	N E W	RT 1		N	RB 3		P 2		---		AT 1	1, 2
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								
STAIR 1	N E W	RS 1		N	RB 3		P 2		---		EXP	1, 2, 6
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								

STAIR 2	N E W	RS 1		N	RB 3		P 2		---		EXP	1, 2, 6
				E	RB 3		P 2		---			
				S	RB 3		P 2		---			
				W	RB 3		P 2		---			
				C								

ELEVATOR 1 & 2	N E W	SV-1		N	LAM 2		LAM 1 / A1.1 / LAM 2		---		EXP	SEE ELEVATOR DRAWINGS
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				E	LAM 2		LAM 1 / A1.1 / LAM 2		---			
				S	LAM 2		LAM 1 / A1.1 / LAM 2		---			
				W	LAM 2		LAM 1 / A1.1 / LAM 2		---			
				C								

--- E N D---

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

- A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
- B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- C. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS Section 09 29 00, GYPSUM BOARD.

**1.3 TERMINOLOGY**

- A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.
- C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Studs, runners and accessories.
  - 2. Hanger inserts.
  - 3. Channels (Rolled steel).
  - 4. Furring channels.
  - 5. Screws, clips and other fasteners.
- C. Shop Drawings:
  - 1. Typical ceiling suspension system.
  - 2. Typical metal stud and furring construction system including details around openings and corner details.
  - 3. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.

- D. Test Results: Fire rating test designation, each fire rating required for each assembly.

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

In accordance with the requirements of ASTM C754.

#### **1.6 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society For Testing And Materials (ASTM)
- 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.

## **2.3 FURRING CHANNELS**

- A. Rigid furring channels (hat shape): ASTM C645.
- B. 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. Manufacturer's standard items fabricated from zinc-coated (galvanized) steel sheet.

2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.
- H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

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

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

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION CRITERIA**

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

### **3.2 INSTALLING STUDS**

- A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.
- B. Space studs not more than 610 mm (24 inches) on center.
- C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.
- D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.
- E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions
- F. Openings:
  1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
  2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.

3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.

G. Fastening Studs:

1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.

H. Chase Wall Partitions:

1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).

- I. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.

- J. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

**3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY**

- A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.

B. Wall furring-Stud System:

1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.

C. Direct attachment to masonry or concrete; rigid channels:

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.
- 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, chalkboards, tackboards, wall-hung casework, 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 FURRED AND SUSPENDED CEILINGS OR SOFFITS**

- A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.
1. Space framing at 400 mm (16-inch) centers for metal lath anchorage.
  2. Space framing at 600 mm (24-inch) centers for gypsum board anchorage.
- B. New exposed concrete slabs:
1. Use metal inserts required for attachment and support of hangers or hanger wires with tied wire loops for embedding in concrete.
  2. Furnish for installation under Division 3, CONCRETE.
  3. Suspended ceilings under concrete rib construction shall have runner channels at right angles to ribs and be supported from ribs with hangers at ends and at 1200 mm (48-inch) maximum intervals along channels. Stagger hangers at alternate channels.
- C. Concrete slabs on steel decking composite construction:
1. Use pull down tabs when available.
  2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.
- D. Where bar joists or beams are more than 1200 mm (48 inches) apart, provide intermediate hangers so that spacing between supports does not exceed 1200 mm (48 inches). Use clips, bolts, or wire ties for direct attachment to steel framing.



- E. Existing concrete construction exposed or concrete on steel decking:
  - 1. Use power actuated fasteners either eye pin, threaded studs or drive pins for type of hanger attachment required.
  - 2. Install fasteners at approximate mid height of concrete beams or joists. Do not install in bottom of beams or joists.
- F. Steel decking without concrete topping:
  - 1. Do not fasten to steel decking 0.76 mm (0.0299-inch) or thinner.
  - 2. Toggle bolt to decking 0.9 mm (0.0359-inch) or thicker only where anchorage to steel framing is not possible.
- G. Installing suspended ceiling system for gypsum board (ASTM C635 Option):
  - 1. Install only for ceilings to receive screw attached gypsum board.
  - 2. Install in accordance with ASTM C636.
    - a. Install main runners spaced 1200 mm (48 inches) on center.
    - b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
    - c. Install wall track channel at perimeter.
- H. Installing Ceiling Bracing System:
  - 1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm (8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap channels not less than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.
  - 2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.
  - 3. Brace suspended ceiling or soffit framing in seismic areas in accordance with ASTM E580.

### **3.6 TOLERANCES**

- A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
- B. Plumb and align vertical members within 3 mm (1/8-inch.)
- C. Level or align ceilings within 3 mm (1/8-inch.)

- - - E N D - - -

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies installation and finishing of interior gypsum board and specification exterior glass mat gypsum sheathing.

**1.2 RELATED WORK**

- A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- B. Installation of Synthetic Cast Stone Masonry: Section 04 72 00, Cast Stone Masonry.
- C. Installation of EIFS finish over exterior sheathing: Section 07 24 00, Exterior Insulation and Finish System.
- D. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.
- E. 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 sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.

2. 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. Abuse-Resistant Gypsum Backing Board: ASTM C36, Type X, 16 mm (5/8 inch) thick.
- C. Water Resistant Gypsum Backing Board: ASTM C620, Type X, 16 mm (5/8 inch) thick - for use as a substrate to ceramic tile, other than tile in shower areas.
- D. Gypsum cores shall contain a minimum of 95 percent post industrial recycled gypsum content. Paper facings shall contain 100 percent post-consumer recycled paper content.
- E. Cement Board: ASTM C1325, (1/2 inch) thick unless shown otherwise - for use as a substrate board in shower areas. Shall contain a minimum of 20 percent recycled gypsum.

### **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 WATER RESISTANT GYPSUM SHEATHING BOARD FOR EXTERIOR**

- A. Description: 5/8" thick water resistant, glass mat, gypsum board sheathing, meeting ASTM C1278 standards and meets or exceeds the physical properties of ASTM C79, ASTM C1177, and ASTM C931 - to be used as a substrate board to the EIFS and to the synthetic stone veneer.
- B. Product: Basis-of-Design Product: USG Securock Firecode X Glass Mat Sheathing, or Contracting Officer's Technical Representative's approved equal.

### **2.4 ACCESSORIES**

- A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.

- B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

## **2.5 FASTENERS**

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

## **2.6 FINISHING MATERIALS AND LAMINATING ADHESIVE**

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:
  - 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. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
  - 7. 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. 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.
- I. Electrical and Telecommunications Boxes:
- 1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.
- J. Accessories:
- 1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
  - 2. Install in one piece, without the limits of the longest commercially available lengths.
  - 3. Corner Beads:
    - a. Install at all vertical and horizontal external corners and where shown.
    - b. Use screws only. Do not use crimping tool.
  - 4. Edge Trim (casings Beads):
    - a. At both sides of expansion and control joints unless shown otherwise.
    - b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
    - c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
    - d. Where shown.

### **3.3 INSTALLING GYPSUM SHEATHING**

- A. Install in accordance with ASTM C840, except as otherwise specified or shown.
- B. Use screws of sufficient length to secure sheathing to framing.
- C. Space screws 9 mm (3/8 inch) from ends and edges of sheathing and 200 mm (8 inches) on center. Space screws a maximum of 200 mm (8 inches) on center on intermediate framing members.

- D. Apply 600 mm by 2400 mm (2 foot by 8 foot) sheathing boards horizontally with tongue edge up.
- E. Apply 1200 mm by 2400 mm or 2700 mm (4 ft. by 8 ft. or 9 foot) gypsum sheathing boards vertically with edges over framing.

### **3.4 CAVITY SHAFT WALL**

- A. Coordinate assembly with Section 09 22 16, NON-STRUCTURAL METAL FRAMING, for erection of framing and gypsum board.
- B. Conform to UL Design No. U438 or FM WALL CONSTRUCTION 12-2/HR (Nonbearing for two-hour fire rating. Conform to FM WALL CONSTRUCTION 25-1/HR (Non-loadbearing) for one-hour fire rating where shown.
- C. Cut coreboard (liner) panels 25 mm (one inch) less than floor-to-ceiling height, and erect vertically between J-runners on shaft side.
  - 1. Where shaft walls exceed 4300 mm (14 feet) in height, position panel end joints within upper and lower third points of wall.
  - 2. Stagger joints top and bottom in adjacent panels.
  - 3. After erection of J-struts of opening frames, fasten panels to J-struts with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
- D. Gypsum Board:
  - 1. Two hour wall:
    - a. Erect base layer (backing board) vertically on finish side of wall with end joints staggered. Fasten base layer panels to studs with 25 mm (one inch) long screws, spaced 600 mm (24 inches) on center.
    - b. Use laminating adhesive between plies in accordance with UL or FM if required by fire test.
    - c. Apply face layer of gypsum board required by fire test vertically over base layer with joints staggered and attach with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
  - 2. One hour wall with one layer on finish side of wall: Apply face layer of gypsum board vertically. Attach to studs with screws of sufficient length to secure to framing, spaced 300 mm (12 inches) on center in field and along edges.
  - 3. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.
- E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.



### **3.5 FINISHING OF GYPSUM BOARD**

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 5 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, and fire 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, and fire 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 and fire protection equivalent to the fire rated construction.

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies ceramic, porcelain tile, waterproofing membranes for thin-set applications, and tile backer board.

**1.2 RELATED WORK**

- A. Preformed sealant joints in tile flooring: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
- B. Sealing of joints where specified: Section 07 92 00, JOINT SEALANTS.
- C. Color, texture and pattern of field tile and trim shapes, size of field tile, trim shapes, and color of grout specified: Section 09 06 00, SCHEDULE FOR FINISHES.
- 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.
  - 3. Porcelain tile, each type, color, patterns and size.
  - 4. Wall (or wainscot) tile, each color, size and pattern.
  - 5. Trim shapes, recessed ceramic soap dishes for patient shower areas, 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 tile, marked to show each type, size, and shape required.
  - 2. Cementitious backer unit.
  - 3. Divider strip.
  - 4. Elastomeric membrane and bond coat.
  - 5. Reinforcing tape.

6. Leveling compound.
  7. Latex-Portland cement mortar and grout.
  8. Commercial Portland cement grout.
  9. Organic adhesive.
  10. Slip resistant tile.
  11. Waterproofing isolation membrane.
  12. Fasteners.
- D. Certification:
1. Master grade, ANSI A137.1.
  2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
    - a. Modified epoxy emulsion.
    - b. Commercial Portland cement grout.
    - c. Cementitious backer unit.
    - d. Elastomeric membrane and bond coat.
    - e. Reinforcing tape.
    - f. Latex-Portland cement mortar and grout.
    - g. Leveling compound.
    - h. Organic adhesive.
    - i. Waterproof isolation membrane.
    - j. 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. 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 0.6, for dry conditions for other areas.
  - 4. Do not use back mounted tiles in showers unless certified by manufacturer as noted in paragraph 1.3.D.
  - 5. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.
- B. Unglazed Ceramic Tile: Nominal 6 mm (1/4 inch) thick with cushion edges.
- C. Glazed Wall Tile: Cushion edges, glazing, as specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Trim Shapes:
  - 1. Conform to applicable requirements of adjoining floor and wall tile.
  - 2. Use slip resistant trim shapes for horizontal surfaces of showers 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 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. Provide cove and bullnose shapes where shown, and required to complete tile work.

## 2.2 CEMENTITIOUS BACKER UNITS

- A. Use in resident toilet rooms that have showers.
- 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**

- A. Conform to ASTM C1178/C1178M
- B. Use in toilet rooms and bath spas that don't have showers or bathtubs.

## **2.6 SETTING MATERIALS OR BOND COATS**

- A. Conform to TCA Handbook for Ceramic Tile Installation.
- B. Latex-Portland Cement Mortar: ANSI A118.4.
  - 1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A118.4.
- C. Organic Adhesives: ANSI A136.1, Type 1.
- D. 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.
- E. 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. Latex-Portland Cement Grout: ANSI A118.6 color as specified.

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

## **2.8 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 METAL DIVIDER STRIPS**

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

## **2.10 WATER**

Clean, potable and free from salts and other injurious elements to mortar and grout materials.

## **2.11 CLEANING COMPOUNDS**

- A. Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- B. Materials containing acid or caustic material not acceptable.

## **2.12 POLYETHYLENE SHEET**

- A. Polyethylene sheet conforming to ASTM D4397.
- B. Nominal thickness: 0.15 mm (six mils).
- C. Use sheet width to minimize joints.

## **PART 3 - EXECUTION**

### **3.1 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before installation and not less than three days after installation.
- B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation and ANSI Specifications for installation.
- C. Do not install tile when the temperature is above 38 degrees C (100 degrees F).
- D. Do not install materials when the temperature of the substrate is below 16 degrees C (60 degrees F).
- E. Do not allow temperature to fall below 10 degrees C (50 degrees F) after fourth day of completion of tile work.

### **3.2 ALLOWABLE TOLERANCE**

- A. Variation in plane of sub-floor, including concrete fills leveling compounds and mortar beds:
  - 1. Not more than 1 in 500 (1/4 inch in 10 feet) from required elevation where Portland cement mortar setting bed is used.
  - 2. Not more than 1 in 1000 (1/8 inch in 10 feet) where dry-set Portland cement, and latex-Portland cement mortar setting beds and chemical-resistant bond coats are used.
- B. Variation in Plane of Wall Surfaces:
  - 1. Not more than 1 in 400 (1/4 inch in eight feet) from required plane where Portland cement mortar setting bed is used.
  - 2. Not more than 1 in 800 (1/8 inch in eight feet) where dry-set or latex-Portland cement mortar or organic adhesive setting materials is used.

### **3.3 SURFACE PREPARATION**

- A. Cleaning New Concrete:
  - 1. Chip out loose material, clean off all oil, grease dirt, adhesives, curing compounds, and other deterrents to bonding by mechanical method, or by using products specifically designed for cleaning concrete and masonry.
  - 2. Use self-contained power blast cleaning systems to remove curing compounds and steel trowel finish from concrete slabs where ceramic tile will be installed directly on concrete surface with thin-set materials.

3. Steam cleaning or the use of acids and solvents for cleaning will not be permitted.

B. Patching and Leveling:

1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.
2. Fill holes and cracks and align concrete floors that are out of required plane with patching and leveling compound.
  - a. Thickness of compound as required to bring finish tile system to elevation shown.
  - b. Float finish except finish smooth for elastomeric waterproofing.
  - c. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
3. Apply patching and leveling compound to concrete and masonry wall surfaces that are out of required plane.
4. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

C. Additional preparation of concrete floors for tile set with epoxy, or furan-resin shall be in accordance with the manufacturer's printed instructions.

D. Walls:

1. In showers or other wet areas cover studs with polyethylene sheet.
2. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.
3. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

### **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 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.

### **3.7 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. Bond Coats:

1. Set floor tile in elastomeric bond coat over elastomeric membrane ANSI 108. 13, TCA System F122 in following spaces, and where shown.  
a. Patient toilet rooms.

b. Bathing suites.

2. Set wall tile installed over concrete backer board in latex-Portland cement mortar, ANSI A108.1B, TCA System W244, in wet, shower and tub areas.

3. Set tile installed over gypsum board in organic adhesive, ANSI A108.4, TCA System W242- - for dry areas only

4. Set trim shapes in same material specified for setting adjoining tile.

D. Workmanship:

1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.
2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise.
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.
- 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.

### **3.8 THIN SET CERAMIC INSTALLED WITH DRY-SET PORTLAND CEMENT AND LATEX-PORTLAND CEMENT MORTAR**

Installation of Tile: ANSI A108.5, except as specified otherwise.

### **3.9 THIN SET CERAMIC WITH ORGANIC ADHESIVE**

Installation of Tile: ANSI A108.4.

### **3.10 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.

#### **B. Workmanship:**

- 1. Install and cure grout in accordance with the applicable standard.
- 2. Portland Cement grout: ANSI A108.10.

### **3.11 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.

#### **3.12 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.

#### **3.13 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.

#### **3.14 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.

**1.2 RELATED WORK**

- A. Color, pattern, and location of each type of acoustical unit:  
Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Access doors in adhesive applied tile: Section 08 31 13, ACCESS DOORS  
AND FRAMES.

**1.3 SUBMITTAL**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA,  
AND SAMPLES.
- B. Samples:
  - 1. Acoustical units, each type, with label indicating conformance to  
specification requirements, including units specified to match  
existing.
- C. Manufacturer's Literature and Data:
  - 1. Ceiling suspension system, each type, showing complete details of  
installation
  - 2. Acoustical units, each type
  - 3. Runners designed for snap-in attachment of metal pans.
- D. Manufacturer's Certificates: Acoustical units, each type, in accordance  
with specification requirements.

**1.4 DEFINITIONS**

- A. Standard definitions as defined in ASTM C634.
- B. Terminology as defined in ASTM E1264.

**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.
    - c. Fire resistant plastic (glass fiber) having a flame spread and smoke developed rating of not more than 25 when tested in accordance with ASTM E84.
  - 2. Use same construction for cross runners as main runners. Use of lighter-duty sections for cross runners is not acceptable.
  - 3. Use aluminum suspension in kitchens and aluminum or fire resistant plastic in toilets adjacent to shower areas, hydrotherapy, and swimming pools.

- B. Exposed grid suspension system for support of lay-in panels:
  - 1. Exposed grid width not less than 22 mm (7/8 inch) with not less than 8 mm (5/16 inch) panel bearing surface.
  - 2. Fabricate wall molding and other special molding from the same material with same exposed width and finish as the exposed grid members.
  - 3. On exposed metal surfaces apply baked-on enamel flat texture finish in color to match adjacent acoustical units unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

## **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).
- C. Clips:
  - 1. Galvanized steel.
  - 2. Designed to clamp to steel beam or bar joists, or secure framing member together.
  - 3. Designed to rigidly secure framing members together.
  - 4. Designed to sustain twice the loads imposed by hangers or items supported.
- D. Tile Splines: ASTM C635.

## **2.5 CARRYING CHANNELS FOR SECONDARY FRAMING**

- A. Fabricate from cold-rolled or hot-rolled steel, black asphaltic paint finish, free of rust.

B. Weighing not less than the following, per 300 m (per thousand linear feet):

Size mm	Size Inches	Cold-rolled		Hot-rolled	
		Kg	Pound	Kg	Pound
38	1 1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

## 2.6 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 in Section 09 06 00, SCHEDULE FOR FINISHES. Colored units integrally colored throughout.
7. Lay-in panels: Sizes as shown, with reveal edges.

B. Type III Units - Mineral base with water-based painted finish less than 10 g/l VOC, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Mineral base to contain minimum 65 percent recycled content.

C. Type IV Units - Mineral base with membrane-faced overlay, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Apply over the paint coat on the face of the unit a poly (vinyl) chloride overspray having a flame spread index of 25 or less when tested in accordance with ASTM E84.

## PART 3 EXECUTION

### 3.1 CEILING TREATMENT

A. Treatment of ceilings shall include sides and soffits of ceiling beams, furred work 600 mm (24 inches) wide and over, and vertical surfaces at

changes in ceiling heights unless otherwise shown. Install acoustic tiles after wet finishes have been installed and solvents have cured.

B. Lay out acoustical units symmetrically about center lines of each room or space unless shown otherwise on reflected ceiling plan.

C. Moldings:

1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.

D. Perimeter Seal:

1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.
2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

### **3.2 CEILING SUSPENSION SYSTEM INSTALLATION**

A. General:

1. Install metal suspension system for acoustical tile and lay-in panels in accordance with ASTM C636, except as specified otherwise.
2. Use direct or indirect hung suspension system or combination thereof as defined in ASTM C635.
3. Support a maximum area of 1.48 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 and bracing wire in concrete forms before concrete is placed. Install hanger wires with looped ends through steel deck if steel deck does not have attachment device.
- b. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger and bracing wire. Install in sides of concrete beams or joists at mid height.

2. Steel:

- a. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels for attachment of hanger wires.
  - (1) Size and space carrying channels to insure that the maximum deflection specified will not be exceeded.
  - (2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.
- b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fire proofing is installed. Weld or use steel clips to attach to beam to develop full strength of carrying channel.
- c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of the bottom chord of the bar joists, and securely wire tie or clip to joist.

C. Direct Hung Suspension System:

1. As illustrated in ASTM C635.
2. Support main runners by hanger wires attached directly to the structure overhead.
3. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.

D. Indirect Hung Suspension System:

1. As illustrated in ASTM C635.
2. Space carrying channels for indirect hung suspension system not more than 1200 mm (4 feet) on center. Space hangers for carrying channels not more than 2400 mm (8 feet) on center or for carrying channels

less than 1200 mm (4 feet) or center so as to insure that specified requirements are not exceeded.

3. Support main runners by specially designed clips attached to carrying channels.

### **3.3 ACOUSTICAL UNIT INSTALLATION**

- A. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
- B. Install lay-in acoustic panels in exposed grid with not less than 6 mm (1/4 inch) bearing at edges on supports.
  1. Install tile to lay level and in full contact with exposed grid.
  2. Replace cracked, broken, stained, dirty, or tile not cut for minimum bearing.

### **3.4 CLEAN-UP AND COMPLETION**

- A. Replace damaged, discolored, dirty, cracked and broken acoustical units.
- B. Leave finished work free from defects.

- - - E N D - - -

**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: Section 09 06 00, SCHEDULE FOR FINISHES.
- 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):



F1344-04.....Rubber Floor Tile  
F1859-04.....Rubber Sheet Floor Covering without Backing  
F1860-04.....Rubber Sheet Floor Covering with Backing  
F1861-02.....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, Type TP Rubber, Thermoplastics, Group 2-layered with molded top. Style B-cove.
- B. Where carpet occurs, use Style A-straight.
- C. Use only one type of base throughout.

### **2.3 RESILIENT TREADS**

- A. Fed. Spec. RR-T-650, Composition A, Type 2, 5 mm (3/16 inch) thick on wear surface tapering to 3 mm (1/8 inch) thick at riser end.
- B. Nosing shape to conform to sub-tread nosing shape.

### **2.4 PRIMER (FOR CONCRETE FLOORS)**

As recommended by the adhesive and tile manufacturer.

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

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

### **2.6 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 COTR.
- B. Submit proposed installation deviation from this specification to the COTR indicating the differences in the method of installation.
- C. The COTR reserves the right to have test portions of material installation removed to check for non-uniform adhesion and spotty adhesive coverage.

### **3.3 PREPARATION**

- A. Examine surfaces on which material is to be installed.
- B. Fill cracks, pits, and dents with leveling compound.
- C. Level to 3 mm (1/8 inch) maximum variations.
- D. Do not use adhesive for leveling or filling.
- E. Grind, sand, or cut away protrusions; grind high spots.
- F. Clean substrate area of oil, grease, dust, paint, and deleterious substances.
- G. Substrate area dry and cured. Perform manufacturer's recommended bond and moisture test.
- H. Preparation of existing installation:
  - 1. Remove existing base and stair treads including adhesive.
  - 2. Do not use solvents to remove adhesives.
  - 3. Prepare substrate as specified.

### **3.4 BASE INSTALLATION**

- A. Location:
  - 1. Unless otherwise specified or shown, where base is scheduled, install base over toe space of base of casework, lockers, laboratory, pharmacy furniture island cabinets and where other equipment occurs.
  - 2. Extend base scheduled for room into adjacent closet, alcoves, and around columns.
- B. Application:
  - 1. Apply adhesive uniformly with no bare spots.
  - 2. Set base with joints aligned and butted to touch for entire height.
  - 3. Before starting installation, layout base material to provide the minimum number of joints with no strip less than 600 mm (24 inches) length.
    - a. Short pieces to save material will not be permitted.

- b. Locate joints as remote from corners as the material lengths or the wall configuration will permit.
- C. Form corners and end stops as follows:
  - 1. Score back of outside corner.
  - 2. Score face of inside corner and notch cove.
- D. Roll base for complete adhesion.

### **3.5 STAIR TREAD INSTALLATION**

- A. Prepare surfaces to receive the treads in accordance with applicable portions of paragraph, preparation.
- B. Layout of Treads.
  - 1. No joints will be accepted in treads.,
  - 2. Set full treads on intermediate and floor landings.
- C. Application:
  - 1. Apply adhesive uniformly with no bare spots.
  - 2. Roll and pound treads to assure adhesion.

### **3.6 CLEANING AND PROTECTION**

- A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets.
- B. Keep traffic off resilient material for at least 72 hours after installation.
- C. Clean and polish materials in the following order:
  - 1. After two weeks, scrub resilient base, sheet rubber and treads materials with a minimum amount of water and a mild detergent. Leave surfaces clean and free of detergent residue. Polish resilient base to a gloss finish.
  - 2. Do not polish tread and sheet rubber materials.
- D. When construction traffic is anticipated, cover tread materials with reinforced kraft paper and plywood or hardboard properly secured and maintained until removal is directed by the COTR.
- 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. Installation of sheet flooring including following:
  - 1. Heat welded seams.

**1.2 RELATED WORK**

- A. Concrete floors: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Color, pattern and texture: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Resilient base over base of lockers, equipment and casework: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- D. Unbacked vinyl (homogenous) sheet flooring with welded seams: Section 09 65 16, RESILIENT SHEET FLOORING.

**1.3 QUALITY CONTROL-QUALIFICATIONS:**

- A. The Contracting Officer shall approve products or service of proposed manufacturer, suppliers, and installers, and the Contractor shall submit certification that:
  - 1. Heat welded seaming is manufacturer's prescribed method of installation.
  - 2. Installer is approved by manufacturer of materials and has technical qualifications, experience, trained personnel, and facilities to install specified items.
  - 3. Manufacturer's product submitted has been in satisfactory operation, on three installations similar and equivalent in size to this project for three years. Submit list of installations.
- B. The sheet vinyl floor coverings shall meet fire performance characteristics as determined by testing products, per ASTM test method, indicated below by Underwriters Laboratories, Inc. (UL) or another recognized testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.
  - 2. Smoke Density: Less than 450 per ASTM E662.
- C. The floor covering manufacturer shall certify that products supplied for installation comply with local regulations controlling use of volatile organic compounds (VOC's).

#### **1.4 SUBMITTALS**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, submit following:
- B. Manufacturer's Literature and Data:
  - 1. Description of resilient material and accessories to be provided.
  - 2. Resilient material manufacturer's recommendations for adhesives, weld rods, sealants, and underlayment.
  - 3. Application and installation instructions.
- C. Samples:
  - 1. Sheet material, 38 mm by 300 mm (1-1/2 inch by 12 inch), of each color and pattern with a welded seam using proposed welding rod // 300 mm (12 inches) square for each type, pattern and color//.
  - 2. Cap strip and fillet strip, 300 mm (12 inches) for integral base.
  - 3. Shop Drawings and Certificates: Layout of joints showing patterns where joints are expressed, and type and location of obscure type joints. Indicate orientation of directional patterns.
  - 4. Certificates: Quality Control Certificate Submittals and lists specified in paragraph, QUALIFICATIONS.
  - 5. Edge strips: 150 mm (6 inches) long each type.
  - 6. Adhesive, underlayment and primer: Pint container, each type.

#### **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

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

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

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

As recommended by the adhesive or sheet flooring manufacturer.

## **2.8 EDGE STRIPS**

- A. Extruded aluminum, mill finish, mechanically cleaned.
- B. 28 mm (1-1/8 inch) wide, 6 mm (1/4 inch) thick, bevel one edge to 3 mm (1/8 inch) thick.
- C. Drill and counter sink edge strips for flat head screws. Space holes near ends and approximately 225 mm (9 inches) on center in between.

## **2.9 SEALANT**

- A. As specified in Section 07 92 00, JOINT SEALANTS.
- B. Compatible with 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.

### **3.3 INSTALLATION OF FLOORING**

- A. Install work in strict compliance with manufacturer's instructions and approved layout drawings.
- B. Maintain uniformity of sheet vinyl floor covering direction and avoid cross seams.
- C. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas, but in no case less than 150 mm (6 inches) away from parallel joints in flooring substrates.
- D. Match edges of resilient floor coverings for color shading and pattern at seams.
- E. Where resilient sheet flooring abuts other flooring material floors shall finish level.
- F. Extend sheet vinyl floor coverings into toe spaces, door reveals, closets, and similar openings.
- G. Inform the Contracting Officer's Technical Representative of conflicts between this section and the manufacturer's instructions or recommendations for auxiliary materials, or installation methods, before proceeding.
- H. Install sheet in full coverage adhesives.
  - 1. Air pockets or loose edges will not be accepted.
  - 2. Trim sheet materials to touch in the length of intersection at pipes and vertical projections; seal joints at pipe with waterproof cement or sealant.
- I. Keep joints to a minimum; avoid small filler pieces or strips.
- J. Follow manufacturer's recommendations for seams at butt joints. Do not leave any open joints that would be readily visible from a standing position.
- 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.

### **3.4 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.

### **3.5 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, COTR 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.

### **3.6 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 COTR.
- 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, 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.....Water Emulsion Floor Finish
  - E648-08.....Critical Radiant Flux of Floor Covering Systems  
Using a Radiant Energy Source
  - E662-06.....Specific Optical Density of Smoke Generated by  
Solid Materials
  - E1155-96 (R2008).....Determining Floor Flatness and Floor Levelness  
Numbers
  - F510-93 (R 2004).....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.....Vinyl Composition Floor Tile
  - F1344-04.....Rubber Floor Tile
  - F1700-04.....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 SOLID VINYL-TILE**

- A. ASTM F1700, 300 mm (12 by 12 inches) square, 3 mm (1/8 inch) thick, homogenous throughout.
- B. Color and Pattern uniformly distributed throughout thickness.
- C. Where solid vinyl tiles are specified, seek products with recycled content.

## **2.3 ADHESIVES**

- A. Comply with applicable regulations regarding toxic and hazardous materials Green Seal (GS-36) for commercial adhesive.
- B. Use low-VOC adhesive during installation. Water based is preferred over solvent based adhesives.

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

As recommended by the adhesive and tile manufacturer.

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

- A. Provide cementitious products with latex or polyvinyl acetate resins in the mix.
- B. Determine the type of underlayment selected for use by the condition to be corrected.

## **2.6 POLISH AND CLEANERS**

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

## **2.7 EDGE STRIPS**

- A. 28 mm (1-1/8 inch) wide unless shown otherwise.
- B. Bevel from maximum thickness to minimum thickness for flush joint unless shown otherwise.
- C. Extruded aluminum, mill finish, mechanically cleaned:
  - 1. Drill and counter sink edge strip for flat head screws.
  - 2. Space holes near ends and approximately 225 mm (9 inches) on center between.
- D. Resilient Edge Strip or Reducer Strip: Fed. Specs. SS-T-312, Solid vinyl.

## **2.8 SCREWS**

Stainless steel flat head screw.

## **2.9 FEATURE STRIPS**

- A. Use same material as floor tile.
- B. Sizes and shapes as shown.

## **PART 3 - EXECUTION**

### **3.1 PROJECT CONDITIONS**

- A. Maintain temperature of materials a minimum of 22 °C (70 °F,) for 48 hours before installation.
- B. Maintain temperature of rooms where work occurs between 21 °C and 27 °C (70 °F and 80 °F), for at least 48 hours, before, during and after installation.
- C. Do not install flooring until building is permanently enclosed and wet construction in or near areas to receive tile materials is complete, dry and cured.

### **3.2 SUBFLOOR PREPARATION**

- A. Verify that concrete slabs comply with ASTM F710. At existing slabs, determine levelness by F-number method in accordance with ASTM E1155. Overall value shall not exceed as follows:  
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.

### **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 Contracting Officer's Technical Representative 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 COTR. 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 COTR.
- E. When protective materials are removed and immediately prior to acceptance, replace any damage tile, re-clean resilient materials, lightly re-apply polish and buff floors.

### **3.5 LOCATION**

- A. Unless otherwise specified or shown, install tile flooring, on floor under areas where casework, laboratory and pharmacy furniture and other equipment occurs, except where mounted in wall recesses.
- B. Extend tile flooring for room into adjacent closets and alcoves.

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**SECTION 09 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,

#### **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 140-07.....Sustainable Carpet Assessment Standard
- C. American Association of Textile Chemists and Colorists (AATCC):  
AATCC 16-04.....Colorfastness to Light  
AATCC 129-05.....Colorfastness to Ozone in the Atmosphere under  
High Humidities  
AATCC 134-06.....Electric Static Propensity of Carpets  
AATCC 165-99.....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 D5116-06.....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 E648-06.....Critical Radiant Flux of Floor-Covering Systems  
Using a Radiant Heat Energy Source

E. The Carpet and Rug Institute (CRI):

CRI 104-02.....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 up to less than 2.0 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC 134.
4. Pile Height: Maximum 3.25 mm (0.10 inch).
5. Pile Fiber: Nylon with recycled content 25 percent minimum branded (federally registered trademark).
6. Pile Type: Level Loop.
7. Backing materials: Manufacturer's unitary backing designed for glue-down installation using recovered materials.
8. Appearance Retention Rating (ARR): Carpet shall be tested and have the minimum 3.5-4.0 Severe ARR when tested in accordance with either the ASTM D 5252 (Hexapod) or ASTM D 5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified.
9. Tuft Bind: Minimum force of 40 N (10 lb) required to pull a tuft or 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.

## **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.
- F. Broadloom Carpet:
  - 1. Install per CRI 104, Section 8.
  - 2. Lay broadloom carpet lengthwise in longest dimension of space, with minimum seams, uniformly spaced to provide a tight smooth finish, free from movement when subjected to traffic.
  - 3. Use tape-seaming method to join sheet carpet edges. Do not leave visible seams.

### **3.3 EDGE STRIPS INSTALLATION**

- A. Install edge strips over exposed carpet edges adjacent to uncarpeted finish flooring.
- B. Anchor metal strips to floor with suitable fasteners. Apply adhesive to edge strips, insert carpet into lip and press it down over carpet.
- C. Anchor vinyl edge strip to floor with adhesive apply adhesive to edge strip and insert carpet into lip and press lip down over carpet.

### **3.4 PROTECTION AND CLEANING**

- A. Remove waste, fasteners and other cuttings from carpet floors.
- B. Vacuum carpet and provide suitable protection. Do not use polyethylene film.
- C. Do not permit traffic on carpeted surfaces for at least 48 hours after installation. Protect the carpet in accordance with CRI 104.
- D. Do not move furniture or equipment on unprotected carpeted surfaces.
- E. Just before final acceptance of work, remove protection and vacuum carpet clean.

- - - E N D - - -



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

**PART 1-GENERAL**

**1.1 DESCRIPTION**

- A. Section specifies field painting.
- B. Section specifies prime coats which may be applied in shop under other sections.
- C. Painting includes shellacs, stains, varnishes, coatings specified, and 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: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Asphalt and concrete pavement marking: Section 32 17 23, PAVEMENT MARKINGS.

**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 COTR.
- B. Finish and texture approved by COTR 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-2008.....Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)  
ACGIH TLV-DOC-2008.....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. 1-07.....Aluminum Paint (AP)  
No. 4-07.....Interior/ Exterior Latex Block Filler  
No. 5-07.....Exterior Alkyd Wood Primer  
No. 7-07.....Exterior Oil Wood Primer

No. 8-07.....	Exterior Alkyd, Flat MPI Gloss Level 1 (EO)
No. 9-07.....	Exterior Alkyd Enamel MPI Gloss Level 6 (EO)
No. 10-07.....	Exterior Latex, Flat (AE)
No. 11-07.....	Exterior Latex, Semi-Gloss (AE)
No. 18-07.....	Organic Zinc Rich Primer
No. 22-07.....	Aluminum Paint, High Heat (up to 590° - 1100°F) (HR)
No. 26-07.....	Cementitious Galvanized Metal Primer
No. 27-07.....	Exterior / Interior Alkyd Floor Enamel, Gloss (FE)
No. 31-07.....	Polyurethane, Moisture Cured, Clear Gloss (PV)
No. 36-07.....	Knot Sealer
No. 43-07.....	Interior Satin Latex, MPI Gloss Level 4
No. 44-07.....	Interior Low Sheen Latex, MPI Gloss Level 2
No. 45-07.....	Interior Primer Sealer
No. 46-07.....	Interior Enamel Undercoat
No. 47-07.....	Interior Alkyd, Semi-Gloss, MPI Gloss Level 5 (AK)
No. 48-07.....	Interior Alkyd, Gloss, MPI Gloss Level 6 (AK)
No. 49-07.....	Interior Alkyd, Flat, MPI Gloss Level 1 (AK)
No. 50-07.....	Interior Latex Primer Sealer
No. 51-07.....	Interior Alkyd, Eggshell, MPI Gloss Level 3
No. 52-07.....	Interior Latex, MPI Gloss Level 3 (LE)
No. 53-07.....	Interior Latex, Flat, MPI Gloss Level 1 (LE)
No. 54-07.....	Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)
No. 59-07.....	Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss (FE)
No. 60-07.....	Interior/Exterior Latex Porch & Floor Paint, Low Gloss
No. 66-07.....	Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved) (FC)
No. 67-07.....	Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR)
No. 68-07.....	Interior/ Exterior Latex Porch & Floor Paint, Gloss
No. 71-07.....	Polyurethane, Moisture Cured, Clear, Flat (PV)
No. 74-07.....	Interior Alkyd Varnish, Semi-Gloss
No. 77-07.....	Epoxy Cold Cured, Gloss (EC)
No. 79-07.....	Marine Alkyd Metal Primer
No. 90-07.....	Interior Wood Stain, Semi-Transparent (WS)
No. 91-07.....	Wood Filler Paste

- No. 94-07.....Exterior Alkyd, Semi-Gloss (EO)
- No. 95-07.....Fast Drying Metal Primer
- No. 98-07.....High Build Epoxy Coating
- No. 101-07.....Epoxy Anti-Corrosive Metal Primer
- No. 108-07.....High Build Epoxy Coating, Low Gloss (EC)
- No. 114-07.....Interior Latex, Gloss (LE) and (LG)
- No. 119-07.....Exterior Latex, High Gloss (acrylic) (AE)
- No. 135-07.....Non-Cementitious Galvanized Primer
- No. 138-07.....Interior High Performance Latex, MPI Gloss Level 2  
(LF)
- No. 139-07.....Interior High Performance Latex, MPI Gloss Level 3  
(LL)
- No. 140-07.....Interior High Performance Latex, MPI Gloss Level 4
- No. 141-07.....Interior High Performance Latex (SG) MPI Gloss  
Level 5
- H. Steel Structures Painting Council (SSPC):
  - SSPC SP 1-04 (R2004)....Solvent Cleaning
  - SSPC SP 2-04 (R2004)....Hand Tool Cleaning
  - SSPC SP 3-04 (R2004)....Power Tool Cleaning

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Wood Sealer: MPI 31 (gloss) or MPI 71 (flat) thinned with thinner recommended by manufacturer at rate of about one part of thinner to four parts of varnish.
- B. Plastic Tape:
  - 1. Pigmented vinyl plastic film in colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES or specified.
  - 2. Pressure sensitive adhesive back.
  - 3. Widths as shown.
- C. Identity markers options:
  - 1. Pressure sensitive vinyl markers.
  - 2. Snap-on coil plastic markers.
- D. Aluminum Paint (AP): MPI 1.
- E. Interior/Exterior Latex Block Filler: MPI 4.
- F. Exterior Alkyd, Flat (EO): MPI 8.
- G. Exterior Alkyd Enamel (EO): MPI 9.
- H. Exterior Latex, Flat (AE): MPI 10.
- I. Exterior Latex, Semi-Gloss (AE): MPI 11.

J. Organic Zinc rich Coating (HR): MPI 22.  
K. High Heat Resistant Coating (HR): MPI 22.  
L. Cementitious Galvanized Metal Primer: MPI 26.  
M. Exterior/ interior Alkyd Floor Enamel, Gloss (FE): MPI 27.  
N. Knot Sealer: MPI 36.  
O. Interior Satin Latex: MPI 43.  
P. Interior Low Sheen Latex: MPI 44.  
Q. Interior Primer Sealer: MPI 45.  
R. Interior Enamel Undercoat: MPI 47.  
S. Interior Alkyd, Semi-Gloss (AK): MPI 47.  
T. Interior Alkyd, Gloss (AK): MPI 49.  
U. Interior Latex Primer Sealer: MPI 50.  
V. Interior Alkyd, Eggshell: MPI 51  
W. Interior Latex, MPI Gloss Level 3 (LE): MPI 52.  
X. Interior Latex, Flat, MPI Gloss Level 1 (LE): MPI 53.  
Y. Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE): MPI 54.  
Z. Interior / Exterior Alkyd Porch & Floor Enamel, Low Gloss (FE): MPI 59.  
AA. Interior/ Exterior Latex Porch & Floor Paint, Low Gloss: MPI 60.  
BB. Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved) (FC): MPI 66.  
CC. Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR): MPI 67.  
DD. Interior/ Exterior Latex Porch & Floor Paint, gloss: MPI 68.  
EE. Epoxy Cold Cured, Gloss (EC): MPI 77.  
FF. Marine Alkyd Metal primer: MPI 79.  
GG. Interior Wood Stain, Semi-Transparent (WS): MPI 90.  
HH. Wood Filler Paste: MPI 91.  
II. Exterior Alkyd, Semi-Gloss (EO): MPI 94.  
JJ. Fast Drying Metal Primer: MPI 95.  
KK. High Build Epoxy Coating: MPI 98.  
LL. Epoxy Anti-Corrosive Metal Primer: MPI 101.  
MM. High Build Epoxy Marine Coating (EC): MPI 108.  
NN. Interior latex, Gloss (LE) and (LG): MPI 114.  
OO. Exterior Latex, High Gloss (acrylic) (AE): MPI 119.  
PP. Waterborne Galvanized Primer: MPI 134.  
QQ. Non-Cementitious Galvanized Primer: MPI 135.  
RR. Interior High Performance Latex, MPI Gloss Level 2(LF): MPI 138.  
SS. Interior High Performance Latex, MPI Gloss Level 3 (LL): MPI 139.  
TT. Interior High Performance Latex, MPI Gloss Level 4: MPI 140.  
UU. 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. Do no exterior painting when it is windy and dusty.
4. Do not paint in direct sunlight or on surfaces that the sun will soon warm.
5. Apply only on clean, dry and frost free surfaces except as follows:
  - a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces where allowed by manufacturer's printed instructions.
  - b. Dampened with a fine mist of water on hot dry days concrete and masonry surfaces to which water thinned acrylic and cementitious paints are applied to prevent excessive suction and to cool surface.
6. Varnishing:
  - a. Apply in clean areas and in still air.
  - b. Before varnishing vacuum and dust area.
  - c. Immediately before varnishing wipe down surfaces with a tack rag.

### **3.2 SURFACE PREPARATION**

A. Method of surface preparation is optional, provided results of finish painting produce solid even color and texture specified with no overlays.

B. General:

1. Remove prefinished items not to be painted such as lighting fixtures, escutcheon plates, hardware, trim, and similar items for reinstallation after paint is dried.
2. Remove items for reinstallation and complete painting of such items and adjacent areas when item or adjacent surface is not accessible or finish is different.
3. See other sections of specifications for specified surface conditions and prime coat.



4. Clean surfaces for painting with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry.

C. Wood:

1. Sand to a smooth even surface and then dust off.
2. Sand surfaces showing raised grain smooth between each coat.
3. Wipe surface with a tack rag prior to applying finish.
4. Surface painted with an opaque finish:
  - a. Coat knots, sap and pitch streaks with MPI 36 (Knot Sealer) before applying paint.
  - b. Apply two coats of MPI 36 (Knot Sealer) over large knots.
5. After application of prime or first coat of stain, fill cracks, nail and screw holes, depressions and similar defects with wood filler paste. Sand the surface to make smooth and finish flush with adjacent surface.
6. Before applying finish coat, reapply wood filler paste if required, and sand surface to remove surface blemishes. Finish flush with adjacent surfaces.
7. Fill open grained wood such as oak, walnut, ash and mahogany with MPI 91 (Wood Filler Paste), colored to match wood color.
  - a. Thin filler in accordance with manufacturer's instructions for application.
  - b. Remove excess filler, wipe as clean as possible, dry, and sand as specified.

D. Ferrous Metals:

1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning). Exception: where high temperature aluminum paint is used, prepare surface in accordance with paint manufacturer's instructions.
3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.

- a. This includes flat head countersunk screws used for permanent anchors.
- b. Do not fill screws of item intended for removal such as glazing beads.
- 4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
- 5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.
- E. Zinc-Coated (Galvanized) Metal, Surfaces Specified Painted:
  - 1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).
  - 2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with MPI 18 (Organic Zinc Rich Coating). Prime or spot prime with MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non- Cementitious Galvanized Primer) depending on finish coat compatibility.
- F. 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 COTR.
- 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 COTR, except in spaces sealed from existing occupied spaces.
  - 1. Apply painting materials specifically required by manufacturer to be applied by spraying.
  - 2. In areas, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in WORK NOT PAINTED, motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.
- H. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

### **3.5 PRIME PAINTING**

- A. After surface preparation prime surfaces before application of body and finish coats, except as otherwise specified.
- B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.
- C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.
- D. Prime rebates for stop and face glazing of wood, and for face glazing of steel.
- E. Wood and Wood Particleboard:
  - 1. Use same kind of primer specified for exposed face surface.

- b. Interior wood except for transparent finish: MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat), thinned if recommended by manufacturer.
  - c. Transparent finishes as specified under Transparent Finishes on Wood.
- 2. Apply two coats of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) to surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reason.
  - 3. Apply one coat of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) as soon as delivered to site to surfaces of unfinished woodwork, except concealed surfaces of shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish.
  - 4. Back prime and seal ends of exterior woodwork, and edges of exterior plywood specified to be finished.
  - 5. Apply MPI 67 (Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR) to wood for fire retardant finish.
- F. Metals except boilers, incinerator stacks, and engine exhaust pipes:
- 1. Steel and iron: MPI 79 (Marine Alkyd Metal Primer). Use MPI 101 (Cold Curing Epoxy Primer) where MPI 77 (Epoxy Cold Cured, Gloss (EC)) or MPI 98 (High Build Epoxy Coating) finish are specified.
  - 2. Zinc-coated steel and iron: MPI 134 (Waterborne Galvanized Primer) 135.
- G. Gypsum Board:
- 1. Surfaces scheduled to have MPI 11 (Exterior Latex, Semi-Gloss (AE)) MPI 53 (Interior Latex, Flat), MPI Gloss Level 1 LE), MPI 52 (Interior Latex, MPI Gloss Level 3 (LE), MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)), MPI 114 (Interior Latex, Gloss (LE) and (LG) finish: Use MPI 11 (Exterior Latex, Semi-Gloss (AE)) MPI 53 (Interior Latex, MPI Gloss Level 3 (LE), MPI 52 (Interior Latex, MPI Gloss Level 3 (LE)), MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE), MPI 114 (Interior Latex, Gloss (LE) and (LG)) respectively.
  - 2. Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) in shower and bathrooms.

4. Use MPI 101 (Cold Curing Epoxy Primer) for surfaces scheduled to receive MPI 77 (Epoxy Cold Cured, Gloss (EC), MPI 98 (High Build Epoxy Coating), or MPI 108 (High Build Epoxy Marine Coating (EC) finish.
- H. Concrete Masonry Units except glazed or integrally colored and decorative units:
  1. MPI 4 (Block Filler) on interior surfaces.
  2. Prime exterior surface as specified for exterior finishes.

### **3.6 EXTERIOR FINISHES**

- A. Apply following finish coats where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Steel and Ferrous Metal, :
  1. Two coats of MPI 8 (Exterior Alkyd, Flat (EO)), , MPI 9 (Exterior Alkyd Enamel (EO)), or MPI 94 (Exterior Alkyd, Semi-Gloss (EO) on exposed surfaces, except on surfaces over 94 degrees C (200 degrees F).
  2. One coat of MPI 22 (High Heat Resistant Coating (HR)) on surfaces over 94 degrees K (200 degrees F) and on surfaces of boiler.

### **3.7 INTERIOR FINISHES**

- A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Metal Work:
  1. Apply to exposed surfaces.
  2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
  3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
    - a. One coat of MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) on exposed interior surfaces of alkyd-amine enamel prime finished windows.
- 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)).
- D. Masonry Walls:
  1. Over MPI 4 (Interior/Exterior Latex Block Filler) on CMU surfaces.
  2. Two coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2 (LF)).
- E. Wood:
  1. Sanding:
    - a. Use 220-grit sandpaper.
    - b. Sand sealers and varnish between coats.

- c. Sand enough to scarify surface to assure good adhesion of subsequent coats, to level roughly applied sealer and varnish, and to knock off "whiskers" of any raised grain as well as dust particles.

2. Sealers:

- a. Apply sealers specified except sealer may be omitted where pigmented, penetrating, or wiping stains containing resins are used.
- b. Allow manufacturer's recommended drying time before sanding, but not less than 24 hours or 36 hours in damp or muggy weather.
- c. Sand as specified.

3. Paint Finish:

- a. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) (SG).

4. Transparent Finishes on Wood.

a. Natural Finish:

- 1) One coat of sealer as written in 2.1 E.
- 2) Two coats of MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV))//MPI 31 (Polyurethane, Moisture Cured, Clear Gloss (PV)).

b. Stain Finish:

- 1) One coat of MPI 90 (Interior Wood Stain, Semi-Transparent (WS)).
- 2) Use wood stain of type and color required to achieve finish specified. Do not use varnish type stains.
- 3) One coat of sealer as written in 2.1 E.
- 4) Two coats of MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV)).

c. Varnish Finish:

- 1) One coat of sealer as written in 2.1 E.
- 2) Two coats of MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV)).

- d. MPI 66 (Interior Alkyd Fire Retardant, Clear Top-Coat(ULC Approved) (FC) where scheduled: Two coats.

F. Miscellaneous:

- 1. Apply where specified in Section 09 06 00, SCHEDULE FOR FINISHES.

**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 Section 09 06 00, SCHEDULE FOR FINISHES.
- B. For additional requirements regarding color see Articles, REFINISHING EXISTING PAINTED SURFACE and MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE.
- C. Coat Colors:
  - 1. Color of priming coat: Lighter than body coat.
  - 2. Color of body coat: Lighter than finish coat.
  - 3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.
- D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:
  - 1. Paint to match color of casework where casework has a paint finish.
  - 2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

### **3.10 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE**

- A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.

- B. In spaces not scheduled to be finish painted in Section 09 06 00, SCHEDULE FOR FINISHES paint as specified under paragraph H, colors.
- C. Paint various systems specified in Division 21 - FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 - HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 - ELECTRONIC SAFETY AND SECURITY.
- D. Paint after tests have been completed.
- E. Omit prime coat from factory prime-coated items.
- F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.
- G. Omit field painting of items specified in paragraph, Building and Structural WORK NOT PAINTED.
- H. Color:
  - 1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
  - 2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:
    - a. White .....Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.
    - b. Gray: .....Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
    - c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).
    - d. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conducts containing fire alarm control wiring, and fire alarm equipment.
    - e. Federal Safety Orange: .Entire lengths of electrical conduits containing feeders 600 volts or more.



- f. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.

I. Apply paint systems on properly prepared and primed surface as follows:

1. Exterior Locations:

- a. Apply two coats of MPI 94 (Exterior Alkyd, Semi-gloss (EO)ferrous metal items:  
Vent and exhaust pipes with temperatures under 94 degrees C (200 degrees F), roof drains, fire hydrants, post indicators, yard hydrants, exposed piping and similar items.
- b. Apply two coats of MPI 11 (Exterior Latex, Semi Gloss (AE)) to the following metal items:  
Galvanized and zinc-copper alloy metal.
- c. Apply one coat of MPI 22 (High Heat Resistant Coating (HR)), 650 degrees C (1200 degrees F) to incinerator stacks, boiler stacks, and engine generator exhaust.

2. Interior Locations:

- a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) to following items:
  - 1) Metal under 94 degrees C (200 degrees F) of items such as bare piping, fittings, hangers and supports.
  - 2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.
  - 3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.
- b. Apply one coat of MPI 50 (Interior Latex Primer Sealer) and one coat of MPI 52 (Interior Latex, MPI Gloss Level 3 (LE)on finish of insulation on boiler breeching and uptakes inside boiler house, drums, drumheads, oil heaters, feed water heaters, tanks and piping.
- c. Apply two coats of MPI 22 (High Heat Resistant Coating (HR)) to ferrous metal surface over 94 degrees K (200 degrees F) of following items:
  - 1) Garbage and trash incinerator.
  - 2) Medical waste incinerator.
  - 3) Exterior of boilers and ferrous metal in connection with boiler settings including supporting members, doors and door frames and fuel oil burning equipment.
  - 4) Steam line flanges, bare pipe, fittings, valves, hangers and supports over 94 degrees K (200 degrees F).

- 5) Engine generator exhaust piping and muffler.
- d. 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 11 (Exterior Latex Semi-Gloss (AE)).

### **3.11 BUILDING AND STRUCTURAL WORK FIELD PAINTING**

- A. Painting and finishing of interior and exterior work except as specified under paragraph 3.11 B.
  - 1. Painting and finishing of new and existing work including colors and gloss of finish selected is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.
  - 2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
  - 3. Painting of ferrous metal and galvanized metal.
  - 4. Identity painting and safety painting.
- B. Building and Structural Work not Painted:
  - 1. Prefinished items:
    - a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
    - b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
  - 2. Finished surfaces:
    - a. Hardware except ferrous metal.
    - b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
    - c. Signs, fixtures, and other similar items integrally finished.
  - 3. Concealed surfaces:
    - a. Inside elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.

- b. Inside walls or other spaces behind access doors or panels.
  - c. Surfaces concealed behind permanently installed casework and equipment.
4. Moving and operating parts:
- a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
  - b. Tracks for overhead or coiling doors, shutters, and grilles.
5. Labels:
- a. Code required label, such as Underwriters Laboratories Inc., Inchcape Testing Services, Inc., or Factory Mutual Research Corporation.
  - b. Identification plates, instruction plates, performance rating, and nomenclature.
6. Galvanized metal:
- a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
  - b. Gas Storage Racks.
  - c. Except where specifically specified to be painted.
7. Metal safety treads and nosings.
8. Gaskets.
9. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundations walls and interior walls in pipe basements.
10. Structural steel encased in concrete, masonry, or other enclosure.
11. Structural steel to receive sprayed-on fire proofing.
12. Ceilings, walls, columns in interstitial spaces.
13. Ceilings, walls, and columns in pipe basements.

### **3.12 IDENTITY PAINTING SCHEDULE**

- A. Identify designated service in accordance with ANSI A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels.
- 1. Legend may be identified using 2.1 G options or by stencil applications.
  - 2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12 000

mm (40 feet) apart on straight runs of piping. Identification next to plumbing fixtures is not required.

3. Locate Legends clearly visible from operating position.
4. Use arrow to indicate direction of flow.
5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on drawings where asterisk appears for High, Medium, and Low Pressure designations as follows:
  - a. High Pressure - 414 kPa (60 psig) and above.
  - b. Medium Pressure - 104 to 413 kPa (15 to 59 psig).
  - c. Low Pressure - 103 kPa (14 psig) and below.
  - d. Add Fuel oil grade numbers.

6. Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower
Continuous Blow-Down		Yellow	Black	Cont. B D
Pumped Condensate		Black		Pump Cond
Pump Recirculating		Yellow	Black	Pump-Recirc.
Vent Line		Yellow	Black	Vent
Alkali		Yellow	Black	Alk
Bleach		Yellow	Black	Bleach
Detergent		Yellow	Black	Det
Liquid Supply		Yellow	Black	Liq Sup
Reuse Water		Yellow	Black	Reuse Wtr
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water		Green	White	RG

Reverse Osmosis	Green	White	RO
Sanitary Waste	Green	White	San Waste
Sanitary Vent	Green	White	San Vent
Storm Drainage	Green	White	St Drain
Pump Drainage	Green	White	Pump Disch
Chemical Resistant Pipe			
Waste	Yellow	Black	Acid Waste
Vent	Yellow	Black	Acid Vent
Atmospheric Vent	Green	White	ATV
Silver Recovery	Green	White	Silver Rec
Oral Evacuation	Green	White	Oral Evac
Fuel Gas	Yellow	Black	Gas
Fire Protection Water			
Sprinkler	Red	White	Auto Spr
Standpipe	Red	White	Stand
Sprinkler	Red	White	Drain

Hot Water Supply Domestic/Solar Water	H.W. Sup Dom/SW
Hot Water Return Domestic/Solar Water	H.W. Ret Dom/SW

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6100 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, 5000, 1500, or 25000, as appropriate.

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

B. Fire and Smoke Partitions:

- 1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.

2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
  3. Locate not more than 6100 mm (20 feet) on center on corridor sides of partitions, and with a least one message per room on room side of partition.
  4. Use semigloss paint of color that contrasts with color of substrate.
- C. Identify columns in pipe basements and interstitial space:
1. Apply stenciled number and letters to correspond with grid numbering and lettering shown.
  2. Paint numbers and letters 100 mm (4 inches) high, locate 450 mm (18 inches) below overhead structural slab.
  3. Apply on four sides of interior columns and on inside face only of exterior wall columns.
  4. Color:
    - a. Use black on concrete columns.
    - b. Use white or contrasting color on steel columns.

### 3.13 PROTECTION CLEAN UP, AND TOUCH-UP

- A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.
- C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

- - - E N D - - -

### APPENDIX

Coordinate the following abbreviations used in Section 09 91 00, PAINTING, with other Sections, especially Section 09 06 00, SCHEDULE FOR FINISHES and other COATING SECTIONS listed. Use the same abbreviation and terms consistently.

Paint or coating    Abbreviation

Acrylic Emulsion    AE (MPI 10 - flat/MPI 11 - semigloss/MPI 119 - gloss)

Alkyd Flat    Ak (MPI 49)

Alkyd Gloss Enamel    G (MPI 48)

Alkyd Semigloss Enamel    SG (MPI 47)

Aluminum Paint    AP (MPI 1)

Cementitious Paint    CEP (TT-P-1411)

Exterior Latex    EL??(MPI 10 / 11 / 119)??

Exterior Oil    EO (MPI 9 - gloss/MPI 8 - flat/MPI 94 - semigloss)



**SECTION 10 14 00**  
**SIGNAGE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies interior signage for room numbers and code required signs.
- B. Installation of Government furnished dedication plaque and VA seal.

**1.2 RELATED WORK**

Color Finish: Section 09 06 00, SCHEDULE FOR FINISHES.

**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 COTR, 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 be uppercase, Helvetica Medium, Helvetica Medium Condensed and Helvetica Regular.
  - 3. Character Height: Minimum 16 mm (5/8 in) high, Maximum 50 mm (2 in).
  - 4. Symbols (Pictograms): Equivalent written description shall be placed directly below symbol, outside of symbol's background field. Border dimensions of symbol background shall be minimum 150 mm (6 in) high.
  - 5. Finish and Contrast: Characters and background shall be eggshell, matte or other non-glare finish with adequate contrast with background.
  - 6. Mounting Location and Height: As shown. Mounted on wall adjacent to the latch side of the door and to avoid door swing and protruding objects.

#### **1.8 COLORS AND FINISHES:**

Section 09 06 00, SCHEDULE FOR FINISHES.

### **PART 2 - PRODUCTS**

#### **2.1 GENERAL**

- A. Signs of type, size and design shown on the drawings and as specified.

- B. Signs shall be ADA ready.
- C. Signs complete with lettering, framing and related components for a complete installation.
- D. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- E. Do not scale drawings for dimensions. Contractor to verify and be responsible for all dimensions and conditions shown by these drawings. COTR to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.
- F. The Sign Contractor, by commencing work of this section, assumes overall responsibility, as part of his warranty of work, to assure that assemblies, components and parts shown or required within the work of the section, comply with the Contract Documents. The Contractor shall further warrant: That all components, specified or required to satisfactorily complete the installation are compatible with each other and with conditions of installations.

## **2.2 PRODUCTS**

- A. Aluminum:
  - 1. Sheet and Plate: ASTM B209.
  - 2. Extrusions and Tubing: ASTM B221.
- B. Cast Acrylic Sheet: MIL-PRF-8184F; Type II, class 1, Water white non-glare optically clear. Matt finish water white clear acrylic shall not be acceptable.
- C. Polycarbonate: MIL-P-46144C; Type I, class 1.
- D. Vinyl: 0.1 mm thick machine cut, having a pressure sensitive adhesive and integral colors.

## **2.3 SIGN STANDARDS**

- A. Topography:
  - 1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps as indicated in Sign Message Schedule.
  - 2. Letter spacing: See graphic standards on drawings.
  - 3. All text, arrows, and symbols to be provided in size, colors, typefaces and letter spacing shown. Text shall be a true, clean, accurate reproduction of typeface(s) shown. Text shown in drawings are for layout purposes only; final text for signs is listed in Sign Message Schedule.

4. Room identification system shall match the system of the existing buildings on the Martinsburg Campus.

B. Project Colors and Finishes: See Section 09 06 00, SCHEDULE FOR FINISHES.

## **2.4 SIGN TYPES**

### **A. General:**

1. The interior sign system is comprised of sign types families that are identified by a letter and number which identify a particular group of signs. An additional number identifies a specific type of sign within that family.

### **B. Interchangeable Component System:**

1. Sign Type Families: 03, 04, 05, 06, 07, 08, 09 10, 11 12, 13, 14, 15, 16 and 17.
2. Interior sign system capable of being arranged in a variety of configurations with a minimum of attachments, devices and connectors.
  - a. Interchangeable nature of the system shall allow for changes of graphic components of the installed sign, without changing sign in its entirety.
  - b. Component Sign System is comprised of the following primary components:
    - 1) Rail Back utilizing horizontal rails, spaced to allow for uniform, modular sizing of sign types.
    - 2) Rail Insert mounted to back of Copy Panels to allow for attachment to Rail Back.
    - 3) Copy Panels, made of a variety of materials to allow for different graphic needs.
    - 4) End Caps which interlock to Rail Back to enclose and secure changeable Copy Panels.
    - 5) Joiners and Accent Joiners connect separate Rail Backs together.
    - 6) Top Accent Bars which provide decorative trim cap that encloses the top of sign or can connect the sign to a Type 03 Room Number Sign.
  - c. Rail Back, Rail Insert and End Caps in anodized extruded aluminum to allow for tight tolerances and consistent quality of fit and finish.
  - d. Signs in system shall be convertible in the field to allow for enlargement from one size to another in height and width through use of Joiners or Accent Joiners, which connect Rail Back panels together blindly, providing a butt joint between Copy Panels.

Accent Joiners shall connect Rail Backs together with a visible 3 mm (1/8") horizontal rib, flush to the adjacent copy insert surfaces.

- e. Sign configurations shall vary in width from 225 mm (9 inches) to 2050 mm (80 inches), and have height dimensions of 50 mm (2 inches), 75 mm (3 inches), 150 mm (6 inches), 225 mm (9 inches) and 300 mm (12 inches). Height shall be increased beyond 300 mm (12 inches), by repeating height module in full or in part.
3. Rail Back functions as internal structural member of sign using 6063T5 extruded aluminum and anodized black.
  - a. Shall accept an extruded aluminum or plastic insert on one sign or on both sides, depending upon sign type.
  - b. Shall be convertible in field to allow for connection to other Rail Back panels, so that additive changes can be made to sign unit.
  - c. Rail shall allow for a variety of mounting devices including wall mounting for screw-on applications, using pressure sensitive tape, freestanding mount, ceiling mount and other mounting devices as needed.
4. Rail Insert functions as a mounting device for Copy Panels on to the Rail Back. The Rail Insert mounts to the back of the Copy Panel with adhesive suitable for use with the particular copy insert material.
  - a. Shall allow Copy Panels to slide or snap into the horizontal Rail Back for ease of changeability.
  - b. Shall mount to the back of the Copy Panel with adhesive suitable for use with particular Copy Panel material.
5. Copy Panels shall accept various forms of copy and graphics, and attaches to the Rail Back with the Rail Insert. Copy Panels shall be either ABS plastic with integral color or an acrylic lacquer finish; photo polymer; or, acrylic.
  - a. Interchangeable by sliding horizontally from either side of sign, and to other signs in system of equal or greater width or height.
  - b. Cleanable without use of special chemicals or cleaning solutions.
  - c. Copy Insert Materials.
    - 1) ABS Inserts - 2.3 mm (.090 inches) extruded ABS plastic core with .07 mm (.003 inches) acrylic cap bonded during extrusion/texturing process. Pressure bonded to extruded Rail Insert using adhesive. Background color is either integral or

painted in acrylic lacquer. ABS inserts finished in a chromium industries #HM335RA texture pattern to prevent glare.

- 2) Photo polymer Inserts - 3 mm (.125 inches) phenolic photo polymer with raised copy etched to 2.3 mm (.0937 inches), bonded to an ABS plastic or extruded aluminum insert with adhesive. Background color is painted in acrylic enamel.
- 3) Changeable Paper/ Insert Holder - Extruded insert holder with integral Rail Insert for connection with structural back panel in 6063T5 aluminum with a black anodized finish. Inserts into holder are paper with a clear 0.7 mm (.030 inches) textured cover. Background color is painted in acrylic lacquer.
- 4) Acrylic - 2 mm (.080 inches) non-glare acrylic. Pressure bonded to extruded Rail Insert using adhesive. Background color is painted in acrylic lacquer or acrylic enamel.
- 5) Extruded 6063T5 aluminum with a black anodized finish Insert Holder with integral Rail Insert for connection with Structural Back Panel to hold a 0.7 mm (.030 inches) textured polycarbonate insert and a Sliding Tile which mounts in the Inset Holder and slides horizontally.
- 6) End Caps - Extruded using 6063T5 aluminum with a black anodized. End Caps interlock with Rail Back with clips to form an integral unit, enclosing and securing the changeable Copy Panels, without requiring tools for assembly.
  - a) Shall be interchangeable to either end of sign and to other signs in the system of equal height.
  - b) Mechanical fasteners can be added to the End Caps that will secure it to Rail Back to make sign tamper resistant.
- 7) Joiners - Extruded using 6063T5 aluminum with a black anodized finish. Rail Joiners connect Rail Backs together blindly, providing a butt joint between Copy Inserts.
- 8) Accent Joiners - Extruded using 6063T5 aluminum with a mirror polished finish. Joiner shall connect Rail Backs together with a visible 3 mm (.125 inches) horizontal rib, flush to the adjacent Copy Panel surfaces.
- 9) Top Accent Rail - Extruded using 6063T5 aluminum with a mirror polished finish. Rail shall provide 3 mm (.125 inches) high decorative trim cap, which butts flush to adjacent Copy Panel and encloses top of Rail Back and Copy Panel.
- 10) Typography

- a) Vinyl First Surface Copy (non-tactile) - Applied Vinyl copy.
- b) Subsurface Copy Inserts - Textured 1 mm (.030 inches) clear polycarbonate face with subsurface applied Vinyl copy. Face shall be back sprayed with paint and laminated to an extruded aluminum carrier insert.
- c) Integral Tactile Copy Inserts - phenolic photo polymer etched with 2.3 mm (.0937 inches) raised copy.
- d) Silk-screened First Surface Copy (non-tactile) - Injection molded or extruded ABS plastic or aluminum insert with first surface applied enamel silk-screened copy.

C. Sign Type Family 01, 02.01 thru 02.05, 08, 09 and 20:

- 1. All text and graphics are to be first surface silk-screened.
- 2. IN-01.12 & IN-01.13: Refer to Sign Type 03 specification for tactile and Braille portion of sign.
- 3. IN-02.4: All text and graphics are to be first surface vinyl letters.
- 4. IN-01.1: Preparation of artwork for reproduction of "fire and emergency evacuation maps" is by manufacturer.

D. Sign Type Families 03:

- 1. Tactile sign is to be made from a material that provides for letters, numbers and Braille to be integral with sign plaque material such as: photosensitive polyamide resin, etched metal, sandblasted phenolic or embossed material. Do not apply letters, numbers and Braille with adhesive.
- 2. Numbers, letters and Braille to be raised 0.793 mm (.0312 inches) from the background surface. The draft of the letters, numbers and Braille to be tapered, vertical and clean.
- 3. Braille dots are to conform with standard dimensions for literary Braille; (a) Dot base diameter: 1.5 mm (.059 inches) (b) Inter-dot spacing: 2.3 mm (.090 inches) (c) Horizontal separation between cells: 6.0 mm (.241 inches) (d) Vertical separation between cells: 10.0 mm (.395 inches)
- 4. Entire assembly is painted in specified color. After painting, apply white or other specified color to surface of the numbers and letters. Entire sign is to have a protective clear coat sealant applied.
- 5. Complete sign is to have an eggshell finish (11 to 19 degree on a 60 degree glossmeter).

E. Sign Type 05:

1. Text if added to Copy Insert module to be first surface applied vinyl letters.
2. Protect text, which is covered by sliding tile, so tile does not wear away letters.

F. Sign Type Family 10:

1. Pocket depth is to be 0.3 mm (.0150 inches).

## **2.5 FABRICATION**

- A. Design components to allow for expansion and contraction for a minimum material temperature range of 56 °C (100 °F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
- B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever and wherever possible.
- C. Shop fabricate so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.
- D. Contact surfaces of connected members be true. Assembled so joints will be tight and practically unnoticeable, without use of filling compound.
- E. Signs shall have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces be smooth flat and without oil-canning, free of rack and twist. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches). Restore texture to filed or cut areas.
- F. Level or straighten wrought work. Members shall have sharp lines and angles and smooth surfaces.
- G. Extruded members to be free from extrusion marks. Square turns and corners sharp, curves true.
- H. Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.
- I. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Edge joints tightly mitered to give appearance of solid material.
- J. All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.

- K. Movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of members. Doors and covers centered in opening or frame. All contact surfaces fit tight and even without forcing or warping components.
- L. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- M. No signs are to be manufactured until final sign message schedule and location review has been completed by the COTR & forwarded to contractor.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Protect products against damage during field handling and installation. Protect adjacent existing and newly placed construction, landscaping and finishes as necessary to prevent damage during installation. Paint and touch up any exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- B. Mount signs in proper alignment, level and plumb according to the sign location plan and the dimensions given on elevation and sign location drawings. Where otherwise not dimensioned, signs shall be installed where best suited to provide a consistent appearance throughout the project. When exact position, angle, height or location is in doubt, contact COTR 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 COTR 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.).

**1.2 RELATED WORK**

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.
- C. Shop Drawings: Showing layout of tracks and method of anchorage.
- D. Manufacturer's Literature and Data:
  - Cubicle curtain track.

**1.4 DELIVERY, STORAGE AND HANDLING**

- A. Deliver material in original package marked to identify the contents, brand name, and the name of the manufacturer or supplier.
- B. Store in dry and protected location. Store so as to not bend or warp the tracks.
- C. Do not open packages until contents are needed for installation, unless verification inspection is required.

**1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - B221-06.....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.
- 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. 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 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.

### **2.3 FINISHES**

Aluminum: Finish numbers for aluminum specified are in accordance with The Aluminum Association's Designation System. AA-C22A31 finish Chemically etched medium matte, with clear anodic coating, Class II Architectural, 0.4 mils thick.

## **2.4 FABRICATION**

- A. Weld and grind smooth joints of fabricated components.
- B. Form tracks and bends of lengths that will produce the minimum number of joints. Make track sections up to 4800 mm (16 feet) without joints. Form corner bend on a 300 mm (12 inch) radius.
- C. Provide steel anchor plates, supports, and anchors for securing components to building construction.
- D. Form flat surface without distortion.
- E. Shop assemble components and package complete with anchors and fittings.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install tracks after finish painting and ceiling finishing operations are complete.
- B. Install track level and hangers plumb and securely anchor to the ceiling to form a rigid installation.
- C. Anchor surface mounted curtain tracks directly to exposed grid of lay-in acoustical tile ceilings with suitable fasteners, spaced approximately 600 mm (24 inches) on center.
- D. Securely fasten end stop caps to prevent their being forced out by the striking weight of carriers.
- E. 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.

- - - E N D - - -

**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 (Artwall System) both horizontal and vertical. Patient wall systems are also referred to as prefabricated bedside patient units or PBPUs.

**1.2 RELATED WORK**

- A. Section 09 06 00, SCHEDULE FOR FINISHES: Color and finishes of the patient wall units.
- B. Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES AND Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES: Requirements for air, oxygen and vacuum outlets in the patient wall units.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section of Division 26.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Raceways and outlet boxes for wiring.
- E. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and wiring.
- F. Section 26 27 26, WIRING DEVICES: Wiring devices to be installed in the patient wall units.
- G. Section 26 24 16, PANELBOARDS: Panelboard requirements for patient wall units with a panelboard.
- H. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground currents.
- I. Section 26 51 00, INTERIOR LIGHTING: Lighting fixture requirements when installed in or connected to the patient wall units.
- J. Section 27 52 23, NURSE CALL/CODE BLUE SYSTEMS: Nurse Call and Code One requirements for installation in the patient wall units.

**1.3 SUBMITTALS**

- A. In accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, submit the following:
- B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
  2. Include electrical ratings, dimensions, mounting details, front view, side view, equipment and device arrangement, wiring diagrams, material, and connection diagrams.
  3. Determine final layout of each style of patient wall system at this stage. Provide configuration drawings showing all possible device (nurse call, medical gases, electrical receptacles and switches, etc.) locations to the COTR. The COTR will provide by return of submittal the desired configuration of each style of patient wall system. Limit the number and type of devices allowed for each style of unit to the number and type of devices specified for that style below.
- C. Manuals: Two weeks prior to the final inspection, deliver four copies of the following to the COTR.
1. Complete maintenance and operating manuals including wiring diagrams, technical data sheets, and information for ordering replacement parts:
    - a. Include complete "As installed" diagrams which indicate all items of equipment, their interconnecting wiring and interconnecting piping.
    - b. Include complete diagrams of the internal wiring for each of the items of equipment, including "As installed" revisions of the diagrams.
    - c. Identify terminals on the wiring diagrams to facilitate installation, maintenance and operation.
- D. Certifications: Two weeks prior to the final inspection, deliver four copies of the following certifications to the COTR:
1. Certification by the manufacturer that the equipment conforms to the requirements of the drawings and specifications.
  2. Certification by the Contractor that the equipment has been properly installed, adjusted, and tested in accordance with the manufacturer's recommendations.

#### **1.4 APPLICABLE PUBLICATIONS:**

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in text by the basic designation only.
- 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. Shall be UL listed.

B. Shall consist of a structural framework, removable panels and removable equipment console units, factory assembled to house all permanent bedside services including but not necessarily limited to fixtures, grounding jacks, power outlets, telephone outlet, nurses call patient station, medical gas outlet(s) and other fittings or devices.

C. Shall conform to the following:

1. Applicable requirements in NFPA 70 (NEC) and NFPA 99.
2. Assembly and all components shall be UL listed or labeled.

D. Coordinate the mounting space provisions for the nurse call equipment with Section 27 52 23, NURSE CALL/CODE BLUE SYSTEMS.

E. Compressed Air, Oxygen and Vacuum System Equipment: Furnish, install and test the equipment in accordance with the drawings and Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES and Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.

1. Fixed medical gas outlets are permanently installed in one location and may not be moved without special tools and shutting off the gas involved.

2. Movable medical gas outlets:

- a. Hose connected to gas manifold type:

- 1) The hoses connected to gas manifold shall be UL listed and labeled for the purpose.
- 2) All hoses shall be accessible at all times. Use bars or other restraining devices to control exposed hoses. A panel may cover the hoses provided it can be easily removed without the use of special tools for hose inspection.

- b. Relocatable type:

- 1) Relocatable (snap-in) without the use of tools to any one of several different fixed locations.
- 2) Appropriate relocatable adapter can be used to access available gases from each fixed location.
- 3) Cover all unused locations with a blank (no gas) adapter plate.

F. Electrical receptacles and switches shall comply with the requirements in Section 26 27 26, WIRING DEVICES; grounding in Section 26 05 26,

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS; and internal wiring in Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW).

G. Styles:

1. Style A1: A single bed patient wall unit consisting of a vertical unit. Refer to the Drawings for Basis-of-Design manufacturer and model number. Horizontal units shall consist of a minimum of three rails (two rails can be used if the bed light is independently mounted). Patient bed light power must be wired through the patient wall unit. Provide a middle rail for power, nurses call and medical gases as well as a bottom rail with bed bumper and for bed motor power. The horizontal unit shall have a vertical chase connecting the rails to the above ceiling junction boxes and gas connection points. Vertical units may be free standing or wall mounted. The width of the vertical unit shall not be less than 600 mm (24 inches) and not more than 750 mm (30 inches) nominal. All electrical devices shall be wired in accordance with the schematic diagram shown on the drawings.
  - a. Provide oxygen gas outlet(s): 2-each fixed or 1-each movable.
  - b. Provide air outlet (s): 2-each fixed or 1-each moveable.
  - c. Provide vacuum outlet(s): 2-each fixed or 2-each movable.
  - d. Provide emergency power outlets: 2-each NEMA 20R single receptacles, self illuminated red with stainless steel or anodized aluminum cover plate, engraved "EMERGENCY POWER" with minimum 6 mm (1/4 inch) red filled letters.
  - e. Provide normal power outlets: 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 Tele-cart jack.
  - h. Provide an auxiliary light (6 to 7 watts) with hood and switch. Both shall be mounted on a stainless steel or an anodized aluminum face plate installed in a single gang box.
  - i. Provide a switch for the overhead/exam light.
  - j. Provide a patient wall mounted bed light fixture. Refer to Section 26 51 00, INTERIOR LIGHTING. The bed light shall be powered through the patient wall unit.

H. All styles of the units shall have the following features:

1. Basic structural framework shall be constructed of heavy gage extruded aluminum or minimum 1.9 mm (14 gage) cold-rolled steel, designed to be a



- self-supporting unit for above-the-floor, for close wall mounting or a freestanding installation. For freestanding units, provide the framework with a base plate and overhead structural supports.
2. Drill and tap the side frame members to permit the installation of front panel devices at modular intervals at any elevation between the top and bottom.
  3. Provide removable front panels:
    - a. Construct panel of the following materials:
      - 1) Fire retarding core material surfaced with a high pressure plastic laminated facing sheet.
      - 2) Vinyl material heat and pressure applied over a minimum of 1.6 mm (0.060 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 specified in the Section 09 06 00, SCHEDULE FOR FINISHES.
    - c. Bond the panel edges with an aluminum extrusion or cold-rolled steel trim designed for mounting directly to the structural framework, thus allowing the panels to be easily removed for access to internal components and for servicing of utility connections or future modifications. Secure panels with hidden screws or other means to offer an overall finished appearance. All exposed metal surfaces or trims greater than 4 mm (1/8 inch) wide shall be of anodized aluminum or stainless steel finished to resist abrasion and affects from hospital cleaning compounds.
  4. Mount patient service components in an equipment console made up of a backbox and finish fascia.
    - a. Use galvanized steel backbox with outlet gang openings on minimum 60 mm (2.4 inches) uniform centers to provide mounting supports of front panel devices. Provide removable metal barriers to separate voltage sources and to facilitate wiring between segregated devices within the same horizontal module.
    - b. Match finish, either anodized aluminum or stainless steel of all fascia and device face plates.
    - c. Fascia and/or face plates may be omitted for power and grounding receptacles in the consoles if the receptacles are mounted flush

in the PBPU cover panel and facilities (support members, tapped holes, spacing, etc.) are provided behind the panel for future addition or relocation of receptacles.

- d. Provide smooth external surfaces having a finished appearance. Maintain adequate spacing of device plates and similar items to eliminate crevices and facilitate cleaning.
- 5. Provide patient services as indicated in paragraphs Styles above, the schematic wiring diagram shown on drawings, and as follows:
  - a. Electrical components: Factory assembled and prewired to a sectionalized junction box at the top of the unit in accordance with circuiting and switching arrangements shown on the drawings. Factory assembled prewiring may be stranded in sizes AWG #10 and #12. Provide an equipotential ground bus with lugs suitable for connecting AWG #14 to AWG #6 conductors with a minimum of 48 screw-type terminals, unless otherwise shown.
  - b. Receptacles: Single Hospital Grade NEMA 5-20R, unless otherwise specified.
  - c. Provide medical gas components compatible with those installed elsewhere in the project that are factory assembled, manifolded and pre-piped, using medical grade copper pipe, to single point connections of each service at the top of the units.
  - d. Provide nurse call services consisting of provisions for adequate space and matching face plates for the equipment and empty conduit to the sectionalized junction box at the top of the unit.
  - e. Provide internal power and signal wiring in separate EMT, flexible metal conduits or approved raceway. Separate normal power circuits from emergency power circuits. Also, provide adequate supports for conduits and piping within the structural frame.
  - f. Telephone outlets/jacks: Plug-in type as approved by the VAMC.
  - g. Except for anodized aluminum and galvanized or stainless steel surfaces, clean and paint all other metal surfaces at the factory with primer and not less than two coats of baked enamel.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION:**

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

HEALTHCARE FACILITIES and Section 22 63 00, GAS SYSTEMS FOR LABORATORY  
AND HEALTHCARE FACILITIES.

2. Install and make connections as required for a complete and  
operational patient wall system for each unit.

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**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 high impact wall covering.

**1.2 RELATED WORK**

- A. Structural steel corner guards: Section 05 50 00, METAL FABRICATIONS.
- B. Color and texture of aluminum and resilient material: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

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

**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(R2004).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
  - B221-07.....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
- E84-07.....Surface Burning Characteristics of Building  
Materials
- C. The National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500 Series.....Metal Finishes Manual
- D. National Fire Protection Association (NFPA):  
80-06.....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. Aluminum Extruded: ASTM B221, Alloy 6063, Temper T5 or T6. Aluminum alloy used for colored anodizing coating shall be as required to produce specified color.
- B. Resilient Material:
  - 1. Extruded and injection molded acrylic vinyl or extruded polyvinyl chloride meeting following requirements:
    - a. Minimum impact resistance of 1197 ps (25 ft lbs per sq.ft) when tested in accordance with ASTM D256 (Izod impact, ft.lbs. per inch notch).
    - b. Class 1 fire rating when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less.
    - c. Rated self extinguishing when tested in accordance with ASTM D635.
    - d. Material shall be labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.
    - e. Integral color with all colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.
    - f. Same finish on exposed surfaces.

### **2.2 CORNER GUARDS**

- A. Resilient, Shock-Absorbing Corner Guards: Flush mounted type of 6 mm 1/4-inch corner) formed to profile shown.

1. Snap-on corner guard formed from resilient material, minimum 2 mm (0.078-inch) thick, free floating on a continuous 1.6 mm (0.063-inch) thick extruded aluminum retainer. Design retainer used for flush mounted type to act as a stop for adjacent wall finish material. Provide appropriate mounting hardware, cushions and base plates as required.
2. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.
3. Flush mounted corner guards installed on any fire rated wall shall maintain the fire rating of the wall. Provide fire test of proposed corner guard system to verify compliance.
  - a. Where insulating materials are an integral part of the corner guard system, the insulating materials shall be provided by the manufacturer of the corner guard system.
  - b. All exposed metal in fire rated assemblies shall have a paintable finish.

## **2.3 WALL GUARDS AND HANDRAILS**

### **A. Resilient Wall Guards and Handrails:**

1. Handrail/Wall Guard Combination: Snap-on covers of resilient material, minimum 2 mm (0.078-inch) thick, shall be free-floated on a continuous, extruded aluminum retainer, minimum 1.8 mm (0.072-inch) thick, anchored to wall at maximum 760 mm (30 inches) on center.
2. Wall Guards (Crash Rails): Snap-on covers of resilient material, minimum 2.8 mm (0.110-inch) thick, shall be free-floated over 50 mm (two-inch) wide aluminum retainer clips, minimum 2.3 mm (0.090-inch) thick, anchored to wall at maximum 600 mm (24 inches) on center, supporting a continuous aluminum retainer, minimum 1.6 mm (0.062-inch) thick; or, shall be free-floated over a continuous extruded aluminum retainer, minimum 2.3 (0.090-inch) thick anchored to wall at maximum 600 mm (24 inches) on center.
3. Provide handrails and wall guards (crash rails) with prefabricated and closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories as required. End caps and corners shall be field adjustable to assure close alignment with handrails and wall guards (crash rails). Screw or bolt closure caps to aluminum retainer.

## **2.4 HIGH IMPACT WALL COVERING**

- ### **A. Fabricate from vinyl acrylic or polyvinyl chloride resilient material**
- minimum 6mm (0.20 inch) thick designed specially for interior use.

B. Provide adhesive as recommended by the wall covering manufacturer.

## **2.5 FASTENERS AND ANCHORS**

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

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

## **2.6 FINISH**

A. In accordance with NAAMM AMP 500 series.

B. Resilient Material: Embossed texture and color in accordance with SAE J 1545 and as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

## **PART 3 - INSTALLATION**

### **3.1 RESILIENT CORNER GUARDS**

Install corner guards on walls in accordance with manufacturer's instructions.

### **3.2 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.

### **3.3 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 identifies those items that are Government Furnished and Contractor Installed (GFCI), and items used in toilets, baths, and at sinks in related spaces, to be purchased and installed by the Contractor[Contractor furnished Contractor Installed (CFCI)].
- B. Items Specified (CFCI):
  - 1. Shower Transfer Bench.
  - 2. Grab Bars: (10800-1.DWG).
  - 3. Clothes hooks, robe or coat.
  - 4. Towel bars.
  - 5. Medicine cabinet.
  - 6. Mirrors
- C. Items that are GFCI:
  - 1. Paper towel dispenser.
  - 2. Soap dispenser.
  - 3. Toilet tissue dispensers.

**1.2 RELATED WORK**

- A. Color of finishes: Section 09 06 00, SCHEDULE FOR FINISHES
- B. Shower curtain break away pendant chain hooks: Section 10 21 23, CUBICLES.
- C. Color of vinyl fabric: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
  - 1. Each product specified.
  - 2. Metal framed mirrors, showing shelf where required, fillers, and design and installation of units when installed on ceramic tile wainscots and offset surfaces.
  - 3. Grab bars, showing design and each different type of anchorage.
  - 4. 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 or containers; labeled for identification with manufacturer's name, brand, and contents.

#### **1.6 STORAGE**

- A. Store products in weathertight and dry storage facility.
- B. Protect from damage from handling, weather and construction operations before, during and after installation in accordance with manufacturer's instructions.

#### **1.7 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):  
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**

- A. Aluminum: ASTM B221, alloy 6063-T5 and alloy 6463-T5.
- B. Stainless Steel:
  - 1. Plate or sheet: ASTM A167, Type 302, 304, or 304L, except ASTM A176 where Type 430 is specified, 0.0299-inch thick unless otherwise specified.
  - 2. Tube: ASTM A269, Alloy Type 302, 304, or 304L.
- C. Stainless Steel Tubing: ASTM A269, Grade 304 or 304L, seamless or welded.
- D. Stainless Steel Pipe: ASTM A312; Grade TP 304 or TP 304L.
- E. Steel Sheet: ASTM A653, zinc-coated (galvanized) coating designation G90.
- F. Glass:
  - 1. ASTM C1036, Type 1, Class 1, Quality q2, for mirrors, 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.
- B. Mechanical finish, medium satin.
  - 1. Stainless Steel: NAAMM AMP 503, finish number 4.
  - 2. 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.
- 3. 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 SHOWER TRANSFER BENCH**

As specified in Section 09 06 00.

#### **2.6 GRAB BARS**

- A. Fed. Spec WW-P-541/8B, Type IV, bars, surface mounted, Class 2, grab bars and ASTM F446.
- B. Fabricate of nylon coated steel, except use only one type throughout the project:
  - 1. Nylon Coated Steel: Grab bars and flanges complete with mounting plates and fasteners. Color is specified under Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Concealed mount.
- D. Bars:
  - 1. Fabricate from 38 mm (1-1/2 inch) outside diameter tubing.
    - a. Nylon coated bars, minimum 1.5 mm (0.0598 inch) thick.
  - 2. Fabricate in one continuous piece with ends turned toward walls, except swing up and where grab bars are shown continuous around three sides of

showers, bars may be fabricated in two sections, with concealed slip joint between.

3. Continuous weld intermediate support to the grab bar.
4. Swing up bars manually operated. Designed to prevent bar from falling when in raised position.

E. Flange for Concealed Mounting:

1. Minimum of 2.65 mm (0.1046 inch) thick, approximately 75 mm (3 inch) diameter by 13 mm (1/2 inch) deep, with provisions for not less than three set screws for securing flange to back plate.
2. Insert grab bar through center of the flange and continuously weld perimeter of grab bar flush to back side of flange.

F. In lieu of providing flange for concealed mounting, and back plate as specified, grab rail may be secured by being welded to a back plate and be covered with flange.

G. Back Plates:

1. Minimum 2.65 mm (0.1046 inch) thick metal.
2. Fabricate in one piece, approximately 6 mm (1/4 inch) deep, with diameter sized to fit flange. Provide slotted holes to accommodate anchor bolts.
3. Furnish spreaders, through bolt fasteners, and cap nuts, where grab bars are mounted on metal stud partitions.

## **2.7 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.

## **2.8 TOWEL BARS**

- A. Fed. Spec. WW-P-541/8B, Type IV, Bar, Surface mounted; Class 1, towel.
- B. Either stainless steel, or chromium plated copper alloy.
- C. Bar Length: 600 mm (24 inches) as shown.
- D. Finish of brackets or supports same as bar.

## **2.9 MEDICINE CABINETS**

- A. Fed. Spec. WW-P-541/8B, Type III Medicine cabinets.
  1. Plastic Shelves.

2. Cabinet Body: Fabricate from 0.9 mm (0.036 inch) thick sheet-steel, with baked enamel finish. Form body in one piece, without seams, and with rounded inside corners.

B. Hinged Door Type:

1. Class 2, Swing door, Style R, Recessed.
2. Fabricate mirror door approximately 400 by 650 mm (16 by 22 26 inches).
3. Cabinet concealed when doors are closed.
4. Door Frame: Channel shape, either (0.060-inch) thick chromium plated brass.
5. Furnish door with full length stainless steel piano hinge, magnetic or friction catches, rubber bumpers, and a 90 degree restraining arm with spring type stop.

## **2.10 MOP RACKS**

- A. Minimum 90 mm (36 inches) long with four 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.

## **2.11 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, 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.

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.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Before starting work notify COTR in writing of any conflicts detrimental to installation or operation of units.
- B. Verify with the COTR the exact location of accessories.

### **3.2 INSTALLATION**

- A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Toggle bolt to steel anchorage plates in frame partitions or hollow masonry. Expansion bolt to concrete or solid masonry.
- C. Install accessories in accordance with the manufacturer's printed instructions and ASTM F446.
- D. Install accessories plumb and level and securely anchor to substrate.
- E. Install accessories in a manner that will permit the accessory to function as designed and allow for servicing as required without hampering or hindering the performance of other devices.
- F. Position and install dispensers, and other devices in countertops, clear of drawers, permitting ample clearance below countertop between devices, and ready access for maintenance as needed.

- 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**

Refer to the Drawings for toilet and bath 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**

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.

**2.4 ACCESSORIES**

Identification: Provide vertical decal letters, in contrasting color to the finished cabinet color, that says: FIRE EXTINGUISHER.

**PART 3 - EXECUTION**

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

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**SECTION 10 51 00**  
**SOLID PHENOLIC LOCKERS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies solid phenolic lockers, located in Corridors 140 and 240.
- B. Lockers are to include door panels, interior surfaces, locker bodies, hardware, base, locking system, and door identification.

**1.2 RELATED WORK**

- A. Instructions: SECTION 01 00 00, GENERAL REQUIREMENTS.
- B. Colors, patterns and finishes selected: SECTION 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product data:
  - 1. Manufacturer's literature and other data showing compliance with the specification.
- C. Certification:
  - 1. Manufacturer's qualifications specified.
  - 2. Installer's qualifications specified.
- D. Shop drawings:
  - 1. Drawings complete, accurate and to scale.
  - 2. Show:
    - a. Location of each component.
    - b. Dimensions and clearance as required.
    - c. Identify each component with both drawing identification and manufacturer's product number.
    - d. Details including cuts, holes, scribes, attachments and specialized construction requirements.
  - 3. Installation procedures: Show dimensions, methods of assembly, anchorage, installation and conditions relating to adjoining work.
  - 4. Complete listing of each component used.
- E. Samples:
  - 1. Door sample, matching color specified in Section 09 06 00.

2. One, self-closing, concealed hinge.

#### **1.4 QUALITY ASSURANCE**

- A. Approval by Contracting Officer is required of manufacturer and installer based upon certification of qualifications specified.
- B. Manufacturer's qualifications:
  - 1. Manufacturer is regularly engaged in design and manufacture of solid phenolic lockers, components and accessories of scope and type similar to requirements of this project for a period of not less than 5 years.
  - 2. Manufacturer has successfully completed at least 3 projects of scope and type similar to requirements of this project.
- C. Installer Qualifications:
  - 1. Installer is approved by solid phenolic locker manufacturer.
  - 2. Installer has completed at least 3 projects in last 5 years in which these products were installed.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store and handle to prevent damage and deterioration until final acceptance of project.
- B. Deliver and store materials in manufacturer's original, labeled containers after building is enclosed and wet work is complete and dry.
- C. Store materials in a secure, locked area.
- D. Repair or replace damaged items due to storage or handling.

#### **1.6 WARRANTY**

Warranty locker system components against structural failure of components, disassembly of cabinets and shelves, subject to terms of "Warranty of Construction" article specified in FAR clause 52.246-21.

#### **1.7 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation.
- B. American Hardwood Association:
  - A135.4-04.....Basic Hardwood
- C. American National Standards Institute (ANSI):
  - A208.1-99.....Particleboard
- D. American Society for Testing and Materials (ASTM):
  - A36M-05.....Carbon Structural Steel

A167-99 (R2004).....Stainless and Heat-Resisting Chromium  
   Steel Plate Sheet and Strip  
 A283/A283M-03(R 2007)...Low and Intermediate Tensile Strength  
   Carbon Steel Plates  
 A366/A366M-97(E 1998)...Steel Sheet, Carbon Cold-Rolled,  
   Commercial Quality  
 A423/A423M-95(R 2004)...Seamless and Electric-Welded Low-Alloy  
   Steel Tubes  
 A568/A568M-07.....Steel, Sheet, Carbon, Structural and High-  
   Strength, Low-Alloy Hot-Rolled and Cold-  
   Rolled, General Requirements  
 B221-06.....Aluminum and Aluminum-Alloy Extruded Bars,  
   Rods Wire, Profiles and Tubes  
 B456-03.....Electrodeposited Coatings of Copper Plus,  
   Nickel Plus Chromium and Nickel Plus  
   Chromium  
 D1201-99 (R2004).....Polyester Thermosetting Molding Compound  
 D4673-02.....Acrylonitrile-Butadiene-Styrene (ABS)  
   Molding and Extrusion Materials  
 E84-07.....Surface Burning Characteristics of  
   Plastics and Alloys Building Materials  
 E. National Association of Architectural Metal Manufacturers (NAAMM):  
   AMP 500-505-88.....Metal Finishes Manual  
 F. 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  
 G. National Fire Protection Association (NFPA):  
   70-07.....National Electric Code (NEC)  
 H. National Sanitation Foundation (NSF):  
   30-92.....Cabinetry and Laboratory Furniture for  
   Hospitals  
 I. U.S. Department of Commerce, Product Standard (PS):  
   PS1-95.....Construction and Industrial Plywood  
 J. Scientific Equipment and Furniture Association (SEFA):  
   2-06.....Installation of Scientific Laboratory  
   Furniture and Equipment  
 K. Underwriters Laboratories (UL): Annual Fire Resistance Directories

## **PART 2- PRODUCT**

### **2.1 DESIGN REQUIREMENTS**

- A. Components provided by one manufacturer. Products of other manufacturers used meet specified flexibility and interchangeability requirements.
- B. Combustible components: core or panel material shall meet fire resistance per ASTM E84, Class A.
- C. Basic Support Components:
  - 1. Locker Units:
    - a. Steel support frames designed to support lockers.
    - b. Lockers shall be installed as wall-attached structures.
    - c. Adjacent lockers capable of being joined together.
    - d. Equip lockers with adjustable floor guides to compensate for uneven floors.
    - e. Lockers equipped with stability accessories such as floor anchors and wall attachments brackets as required. Show details on shop drawings.
    - f. Lockers have end panels where noted. End panels capable of supporting storage assemblies.
    - g. Lockers shipped completely finished preassembled, ready for installation.
  - 2. Horizontal Support Rail:
    - a. Fabricated of steel or aluminum.
    - b. Designed to suspend selected components in one place, allowing them to be removed and replaced in same or different location.
    - c. Rail designed to be supported from vertical rails or service modules.
    - d. Rail able to be cut to any length using simple hand tool or applied to form continuous runs.
- D. Lockers:
  - 1. Fabricate with no exterior cracks, crevices, joints corners or angles that may facilitate bacterial accumulation. Lockers are to be 2-tier, Z-type, size: overall height: 71-3/3"; overall width: 12"; overall depth: 18-3/8".
- E. Doors:
  - 1. Material: 1/2 thick solid phenolic composite materials.
- F. Locker Bodies:
  - 1. Exposed edges: Straight profile; eased edges.

2. Tops, bottoms, and intermediate shelves: 1/2" thick solid phenolic.
  3. Locker backs: 1/4" thick solid phenolic.
  4. Locker sides: 3/8" thick solid phenolic composite material
- G. Hardware:
1. Hinges:
    - a. 316-grade stainless steel, concealed, self-closing.
    - b. Quantity: 2 for multi-tier units.
    - c. Interior hooks: stainless steel, manufacturer's standard prong arrangement.
  2. Door Identification:
    - a. Manufacturer's standard plates.
- H. Locking System:
1. Manufactures standard design, hasp for padlock.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and adjoining construction and conditions under which work is to be installed.
- B. Do not proceed with the work until unsatisfactory conditions detrimental to proper and timely completion of the work have been corrected.

#### **3.2 SEQUENCING AND SCHEDULE**

- A. Begin only after work of other trades is complete, i.e., wall and floor finish completed, ceilings installed, light fixtures and diffusers installed and connected and area is free of trash and debris.
- B. Fixed components may be installed in areas which can not be secured.
- C. Install non-fixed components and accessories just prior to final inspection, unless areas where installation is complete is locked against entry.
- D. Coordinate with DIVISION 21, FIRE SUPPRESSION, DIVISION 22, PLUMBING, DIVISION 23, HEATING, VENTILATING, AND AIR CONDITIONING, DIVISION 26, ELECTRICAL, DIVISION 27, COMMUNICATIONS, and DIVISION 28, DIVISION ELECTRONIC SAFETY AND SECURITY trades to avoid interference and completion of service connections.

#### **3.3 INSTALLATION**

- A. Assemble and install components in accordance with manufacturer's written instructions and recommendation and SEFA 2.3

- B. Anchor fixed components firmly in position; square, level, plumb and properly connect using mechanical fasteners, wood or sheet metal screws are not permitted.
- C. Perform cutting of components to receive work installed by others.
- D. Support Rail Attachments:
  - 1. Install true to horizontal at heights shown; maximum tolerance for uneven floors is plus or minus 13 mm (1/2 inch).
  - 2. Shim as necessary to accommodate variations in wall surface not exceeding 5 mm (3/16 inch) at fastener.

#### **3.4 ADJUSTMENTS**

- A. Adjust equipment to insure proper alignment and operation.
- B. Replace or repair damaged or improperly operating materials, components or equipment.

#### **3.5 CLEANING**

- A. Immediately following installation, clean each item, removing finger marks, soil and foreign matter resulting from work of this section.
- B. Remove from job site trash, debris and packing materials resulting from work of this section.
- C. Leave installed areas clean of dust and debris resulting from work of this section.

-----END-----



## **SECTION 11 13 00**

### **LOADING DOCK EQUIPMENT**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Dock bumpers.

##### **1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Warranty: Sample of special warranty.

##### **1.3 QUALITY ASSURANCE**

Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

##### **1.4 PROJECT CONDITIONS**

Field Measurements: Verify actual dimensions of construction contiguous with loading dock equipment, including slopes of driveways and heights of loading docks, by field measurements before fabrication.

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.
- B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- C. Pressure-Treated Wood: DOC PS 20 dimension lumber, select structural grade, kiln dried, and pressure treated with waterborne preservatives to comply with AWPA C2.

## **2.2 DOCK BUMPERS**

- A. Basis-of-Design Manufacturer, or COTR approved equal:
  - 1. Pawling Corporation; Architectural Products Division.
- B. Molded-Rubber Bumpers: Fabricated from molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Type A Shore durometer hardness of 80, plus or minus 5, when tested according to ASTM D 2240; of size and configuration indicated. Fabricate units with not less than two predrilled anchor holes.
  - 1. Configuration: Rectangular.
  - 2. Thickness: 4 inches (100 mm).
- C. Anchorage Devices: Hot-dip galvanized-steel anchor bolts, nuts, washers, bolts, sleeves, cast-in-place plates, and other anchorage devices as required to fasten bumpers securely in place and to suit installation type indicated.

## **2.3 STEEL FINISHES**

- A. Galvanizing: Hot-dip galvanize components as indicated to comply with the following:
  - 1. ASTM A 123/A 123M for iron and steel loading dock equipment.
  - 2. ASTM A 153/A 153M or ASTM F 2329 for iron and steel hardware for loading dock equipment.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Dock Bumpers: Attach dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.
  - 1. Welded Attachment: Plug-weld anchor holes in contact with steel inserts and fillet weld at other locations.
  - 2. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.
  - 3. Screw Attachment: Attach dock bumpers to wood construction with lag bolts as indicated.

--- END ---

**SECTION 11 40 00**  
**FOOD STORAGE EQUIPMENT**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The work referred to in this section consists of furnishing all labor and material required to provide and deliver all equipment hereinafter specified into the building, uncrate, assemble, hang, set in place, level, and completely install, exclusive of final utility connections.
- B. Coordinate but do not install (unless specifically directed to do so in the technical specifications) Owner and Vendor-supplied equipment noted on the drawings or in the specifications. Show on roughing in plans the sizes, utilities, and other requirements as furnished in the Specifications, by Owner or appropriate supplier in submittals as if the equipment is contractor furnished.
- C. Coordinate and show sizes, utilities, and other requirements as determined by physical inspection for equipment noted as existing to be reused. Include costs for marking, removing, storing, cleaning, redelivering and installing such equipment. All requirements within the project manual apply to reused equipment except warranty as if contractor furnished including but not limited to code compliance and accessories necessary to conform with the new application.

**1.2 RELATED WORK**

- A. Plumbing Connections: Section 22 11 00, FACILITY WATER DISTRIBUTION.
- B. Electrical Connections: Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW)

**1.3 QUALITY CONTROL**

- A. Standard Products: Materials, products, and equipment furnished under this contract shall be the standard items of manufacturers regularly engaged in the production of such materials, products, and equipment and shall be of the manufacturers' latest design that complies with the specifications.
- B. Manufacturers' Qualifications: Manufacturers shall be regularly engaged in the production of the items furnished and shall have demonstrated the capability to furnish similar equipment that performs the functions specified or indicated herein.

- C. Installation Qualifications: Contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work defined in this Section.
- D. Coordination of Work: Coordinate work with the respective trades performing preparatory work for installation of equipment under this Contract, including, but not limited to: construction of pits, trenches, receptors; rough-in of supply, waste and vent piping; electrical connections; and field verification of dimensions.
- E. Product Options: Drawings indicate foodservice equipment based upon equipment specified herein. All substitutions shall be in compliance with the requirements in Division 1 ( or Section I, if appropriate.).
- F. Conflict: Where written specifications and drawings conflict or appear to conflict, request clarification. Prior to receiving clarification use the greater quality or greater quantity.

#### **1.4 SUBMITTALS**

- A. Upon award of Contract, furnish the Architect with reproducible copies of the following drawings, in accordance with the approved project schedule, which shall be made on sheets equal in size and matching the bid set drawing size. Reproduced copies of bid documents will not be accepted for this purpose in any fashion.
  - 1. Equipment specified for fabrication shall be detailed and fully dimensioned to a minimum scale of  $\frac{3}{4}" = 1'-0"$  (1:20) for plan and elevation views and  $1\frac{1}{2}" = 1'-0"$  (1:10) for sections.
  - 2. Prepare separate electrical and mechanical dimensioned rough-in drawings at  $\frac{1}{4}" = 1'-0"$  (1:50) showing exact point of penetration of floors, walls, and ceilings for all services required to operate the equipment that the Contractor shall furnish, including the requirements for Contractor supplied and installed refrigerant and beverage piping line runs. These drawings shall also show exact locations of final connections to equipment. Indicate floor drains, floor sinks, receptacles, lights, and other special conditions related to the equipment known to the Contractor but provided under other Sections.

3. Dimensioned drawings shall be submitted showing the location and size of all bases, depressions, grease interceptors, special height walls, openings in walls for equipment or operations, and critical dimensions, etc. Drawings shall be drawn to a scale of not less than  $\frac{1}{4}" = 1'-0"$  (1:50).

- B. Manufacturers' Data: Upon award of Contract, submit bound copies of Manufacturers' Illustrations and Technical Data to the Architect for review prior to procurement. Items of Standard Manufacture shall be submitted, including items purchased to be built into fabricated equipment. Each illustration shall be marked to describe accurately the item to be furnished as specified, including voltage, phase, load, accessories, etc.
- C. Manufacturers' List: Submit in writing a list of all manufacturers' representatives of the foodservice equipment, such as convection ovens, ranges, etc., and their authorized service agencies' addresses and telephone numbers.
- D. Foundation Data: Data and drawings shall be submitted for each item, if any, requiring special foundations, structures, or supports. Such foundations, structures, or supports will be provided and installed by other appropriate trades in accordance with the drawings and specifications which shall be provided by the Contractor and reviewed by the Architect.
- E. Operation and Maintenance Manuals: Provide three bound copies of operation, maintenance, and parts manuals for all equipment items of standard manufacture including standard component assemblies built into all custom-fabricated items.
- F. Review by the Architect of the drawings and brochures submitted by the Contractor does not waive the responsibility of the Contractor to furnish each item of equipment in complete compliance with the specifications and contract drawings.
- G. The number of copies of all submittals shall be as determined by the Architect.
- H. Samples: Samples of materials, products, and fabrication methods shall be submitted for review at no additional cost, before proceeding with the work.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver foodservice equipment in containers designed to protect equipment and finish until final installation. Make arrangements to receive equipment at project site at a time and place agreed with the General Contractor. If the site is not ready for delivery, then either delay delivery or arrange to hold in a secure and protected warehouse until delivery can be made to job site.
- B. Store foodservice equipment in original containers and in location to provide adequate protection to equipment while not interfering with other construction operations. Coordinate with other trades so that worktables, serving counters and equipment are not used for scaffolding or as workbenches.
- C. Handle foodservice equipment carefully to avoid damage to components, enclosures, and finish. Do not install damaged foodservice equipment; replace and return damaged components to equipment manufacturer.

#### **1.5 APPLICABLE CODES AND STANDARDS**

- A. Except as otherwise indicated, each item of equipment shall comply with the latest current edition of the following standards as applicable to the manufacture, fabrication, and installation of the work in this section. Comply with all Federal, State, and Municipal regulations and notifications which bear on the execution of this work. Call to the attention of the Owner in writing any design conflict with the requirements of the Americans with Disabilities Act (ADA) during Bid Process so resolution can be effected prior to Contract Award.
  - 1. NSF Standards: Comply with applicable National Sanitation Foundation standards and criteria and provide NSF "Seal of Approval" on each manufactured item and on major items of custom-fabricated work.
  - 2. UL / ETL / CSA Standards: For electrical components and assemblies, provide either UL / ETL / CSA listed products or, where no listing service is available, provide a complete index of the components used as selected from the UL / ETL / CSA "Recognized Component Index." For fire extinguishing systems comply with UL 300.
  - 3. ANSI Standards: Comply with applicable ANSI standards for electric-powered and gas-burning equipment; for piping to compressed-gas cylinders; and for plumbing fittings,

including vacuum breakers and air gaps, to prevent siphonage in water piping.

4. AGA / CGA: All gas-fired equipment shall be AGA / CGA approved, equipped to operate on the type gas available at the job site, and shall contain 100% automatic safety shut-off devices.
5. NFPA Standards: Comply with NFPA Bulletin 96 for exhaust systems; with NFPA Bulletins 13, 17, 17A and 96 for fire extinguishing systems; and with NFPA 54, National Fuel Gas Code and NFPA 70, National Electrical Code.
6. ASME Code: Comply with ASME boiler code requirements for steam-generating and steam-heated equipment; provide ASME inspection, stamps, and certification of registration with National Board.
7. SMACNA Guidelines: Provide seismic restraints for food service equipment to comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Kitchen Equipment Fabrication Guidelines", appendix 1, "Guidelines for Seismic Restraints of Kitchen Equipment", unless otherwise indicated.
8. ASHRAE: Provide mechanical refrigeration systems complying with the American Society of Heating, Refrigerating and Air Conditioning Engineers' ASHRAE 15, "Safety Code for Mechanical Refrigeration".

#### **1.6 PROJECT CONDITIONS**

- A. Visit the job site to field check actual wall dimensions and roughing-in and be responsible for furnishing, fabricating, and installing the equipment in accordance with the available space and utility services as they exist on the job site for an accurate fit.
- B. Check all door openings, passageways, elevators, etc., to be sure that the equipment can be conveyed to its proper location within the building and, if necessary, check with the Contractor regarding the possibility of holding wall erection, placement of doorjambs, windows, etc., for the purpose of moving the equipment to its proper location. Any removal and rebuilding of walls, partitions, doorjambs, etc., necessary to place the equipment or, if caused by incorrect information on the Contractor's drawings, shall be done at the expense of the Contractor.

- C. Physically check the location and utility size of all "rough-ins" at the job site for compatibility with the equipment being installed before finished floors, walls, and/or ceilings are in place.
- D. Check electrical characteristics and water, steam, and gas pressure. Provide pressure-regulating valves where required for proper operation of equipment.

#### **1.7 GUARANTIES AND WARRANTIES**

- A. Self-contained or remote refrigeration systems furnished under this Contract shall be provided with start-up and a one-year service contract providing free service, 24 hours per day, seven days per week, including parts and labor. Hermetic or semi-hermetic compressors shall be covered by the manufacturers' factory warranty for an additional four years. Other equipment provided shall include a one-year warranty covering parts and labor, plus any extended warranties as normally provided by individual manufacturers. Equipment including refrigeration systems both self-contained and remote shall be warrantied by the Contractor on the project for one year as indicated in the preceding sentence. The first day of the first year commences upon the issuance of a certificate of occupancy for each area.

### **PART 2 - PRODUCTS**

#### **2.1 GENERAL**

- A. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. Parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.
- B. Means shall be provided to ensure adequate lubrication for moving parts. Oil holes, grease fittings, and filler caps shall be accessible without the use of tools.
- C. Plastic nameplates, to identify controls on fabricated equipment and when specified elsewhere, shall be provided of two-ply, 1/16" (2 mm), rigid plastic material which shall be specifically manufactured for engraving such nameplates. The finished nameplate shall be machine engraved with white letters on a black background and shall have edges beveled at a 45° angle. Nameplates shall be attached using an adhesive recommended by the manufacturer of the engraved material.
- D. The design of the equipment shall be such as to provide for safe and convenient operation. Covers or other safety devices shall be provided for all items of equipment presenting safety hazards. Such guards or



safety devices shall not present substantial interference to the operation of the equipment. Guards shall provide easy access to guarded parts.

- E. Trim shall not be an acceptable substitute for accuracy and neatness. When trim is required and accepted by Architect in lieu of rejection of items of equipment, it shall be the Contractor's responsibility to provide same at no additional cost.
- F. Unless otherwise specified herein, no material lighter than #20 gauge shall be incorporated into the work. Gauges for sheet iron and sheet steel shall be U.S. Standard Gauges and finished equipment gauge thickness shall not vary more than 5% plus or minus from the thickness indicated below.

<u>GAUGE</u>	<u>THICKNESS</u>	<u>GAUGE</u>	<u>THICKNESS</u>
#10	0.1406" (3.0mm)	#16	0.0625" (1.6mm)
#12	0.1094" (2.5mm)	#18	0.0500" (1.25mm)
#14	0.0781" (2.0mm)	#20	0.0375" (1.0mm)

- G. Materials or work described in words which have a well-known and accepted technical or trade meaning shall be held to refer to such accepted meanings.

## **2.2 MATERIALS**

- A. Submit a certified copy of the mill analysis of materials if requested by the Architect.
- B. Stainless steel sheets shall conform to American Society for Testing and Materials (ASTM) specification A240, Type 304 Condition A, 18-8, having a No. 4 finish. A No. 2B finish shall be acceptable on surfaces of equipment not exposed to view. Sheets shall be uniform throughout in color, finish, and appearance.
- C. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.
- D. Rolled shapes shall be of the cold-rolled type conforming to ASTM A36.
- E. Galvanized sheet steel shall conform to ASTM A526; where extensive forming to take place, conform to ASTM A527; conform to ASTM A525, coating designation G115, chemical treatment.

- F. Galvanized steel sheets shall be cold-rolled, stretcher leveled, bonderized, and rerolled to ensure a smooth surface.
- G. Castings shall be corrosion-resisting metal containing not less than 30% nickel. Castings shall be rough ground, polished, and buffed to bright luster and free from pit marks, runs, checks, burrs, and other imperfections. In lieu of corrosion-resisting metal castings, die-stamped or cast 18-8 stainless steel will be acceptable.
- H. Millwork materials shall be free from defects impairing strength, durability, or appearance; straight and free from warp; and of the best grade for their particular function. Wood shall be well seasoned and kiln dried and shall have an average moisture content of 8%, a maximum of 10%, and a minimum of 5%.

1. Plywood and other woodwork of treatable species, where so required by the code, shall be fire-retardant treated to result in a flame spread rating of 25 or less with no evidence of significant progressive combustion when tested for 30 minutes duration under ASTM E84 and shall bear the testing laboratory mark on a surface to be concealed.
2. Concealed softwood or hardwood lumber shall be of poplar, Douglas fir, basswood, red oak, birch, maple, beech, or other stable wood and shall be select or better grade, unselected for color and grain, surfaced four sides, square-edged, and straight. Basswood may be used where fire-retardant treated materials are required.
3. Plywood for transparent finish shall conform to U.S. Product Standard PS-51-71, Type I (fully waterproofed bond), with architectural grade face veneers of species as specified, free of all pin knots, patches, color streaks and spots, sapwood, and other defects. Plywood designated to have plywood cores shall be of either 5 ply or 7 ply construction. Plywood so designated on the drawings and plywood not otherwise shown shall have a particle board core, cross banding of veneers, and face and back veneers. Particle board cores shall have a 45-pound density, except where the fire retardant treatment requires cores of lesser density.

4. Face veneers shall be matched for color and grain to produce balance and continuity of character. Mineral streaks and other discolorations, worm holes, ruptured grain, loose texture, doze, or shake will not be permitted. Face veneer leaves on each surface shall be full-length, book matched, center matched, and sequence matched. Surfaces shall be sequenced and blueprint matched. Veneers not otherwise indicated shall be plain sliced. Backing veneers for concealed surfaces shall be of a species and thickness to balance the pull of the face veneers.
5. Hardwood plywood for painted surfaces shall conform to U.S. Product Standard PS-51-71, Type I, and shall have sound birch, maple, or other approved close grain hardwood faces suitable for a paint finish.
6. Perforated hardboard shall be a tempered hardboard,  $\frac{1}{4}$ " (6 mm) thick, conforming to Federal Specification LLL-B-810B, Type I, SIS, Finish B (primed), Design B (perforated), with  $\frac{1}{4}$ " (6 mm) diameter holes spaced on 1" (25 mm) centers both ways.
7. Plastic laminate surfaces shall be laminated with thermosetting decorative sheets of the color, pattern, and style as selected by the Architect. Horizontal surfaces shall be laminated with sheets conforming to Federal Specification L-P-508F, Style D, Type I (general purpose), Grade HP, Class 1,  $\frac{1}{16}$ " (2 mm) thick, satin finish, with rough sanded backs. Vertical surfaces shall be laminated with sheets conforming to Federal Specification L-P-598F, Style D, Type II, (vertical surface), Grade HP, Class 1, non-forming, satin finish,  $\frac{1}{32}$ " (1 mm) thick or heavier. Surfacing for curved surfaces shall be laminated from sheets conforming to Federal Specification L-P-508F, Style D, Type III (post-forming), Grade HP, Class 1, satin finish. Balance sheets for backs in concealed locations shall be either reject material of the same type and thickness as the general purpose grade facing or may be .020" (0.5 mm) thick laminate backing sheets

conforming to Federal Specification L-P-00508E, Style ND, Type V (backing sheet), Grade HP.

8. Adhesive for application of plastic laminate to wood substrates of counter tops shall be a phenolic, resorcinol, or melamine adhesive conforming to Federal Specification MMM-A-181C and producing a waterproof bond. Adhesive for applying plastic laminate to vertical surfaces shall be either a waterproof type or a water resistant type such as a modified urea-formaldehyde resin liquid glue conforming to Federal Specification MMM-A-188C. Contact adhesive will not be acceptable.
9. Plywood for laminate assemblies shown or specified with plywood core shall be of the 5 or 7 ply construction with sanded close-grain hardwood face and back veneers, laminated with waterproof glue, in thickness shown, conforming to U.S. Product Standard PS-51-71. Particle board for plastic laminate assemblies shown or specified with particle board wood core shall conform to U.S. Products Standard CS-236-66, Type 1 or 2, Grade B (45 pound density), Class 2; except where fire-retardant treatment is required, the density shall conform to the treatment requirements.
- I. Sealant: ASTM C 920; type S, Grade NS, Class 25, use, NT. Provide elastomeric sealant, NSF certified for end use application indicated. Provide sealant that, when cured and washed, meet requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food. Dow-Corning #780 or General Electric "Silastic" or approved equal in either clear or approved color to match surrounding surfaces and applied in accordance with sealant manufacturers' recommendations for smooth, sealed finish.
- J. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear), Quality q3 (glazing select). Provide products complying with ANSI Z97.1, manufactured by horizontal (roller hearth) process and  $\frac{3}{4}$ " (6 mm) thick, unless otherwise indicated. Provide exposed safety edges, if any, seamed before tempering.

- K. Sound Dampening: NSF-certified, non-absorbent, hard-drying, sound deadening coating. Provide coating compounded for permanent adhesion to metal in 1/8" (3 mm) thickness that does not chop, flake, or blister.

### **2.3 FINISHES**

- A. Paint and coatings shall be of an NSF approved type suitable for use in conjunction with foodservice equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking, and mildew resistant; shall comply with all governing regulations; and shall be applied in accordance with the recommendations of the manufacturer.
- B. Exterior, galvanized parts, exposed members of framework, and wrought steel pipe where specified to be painted shall be cleaned, properly primed with rust-inhibiting primer, degreased, and finished with two (2) coats of epoxy-based gray hammertone paint, unless otherwise specified.
- C. Stainless steel, where exposed, shall be polished to a #4 commercial finish. Where unexposed, finish shall be #2B. The grain of polishing shall run in the same direction wherever possible. Where surfaces are disturbed by the fabricating process, such surfaces shall be finished to match adjacent undisturbed surfaces.
- D. Galvanized shelving shall not be painted.
- E. Fabricated equipment shall be spray coated with plastic suitable for protecting the equipment during transport and installation. The coating shall be easily removable and shall be removed after the equipment installation is complete at the work site or, alternatively, when directed by the Architect.
- F. Exposed surfaces on brass, bronze, or steel shall be plated with chromium over nickel in accordance with Federal Specifications WW-P-541, Paragraph 9.5 and Table 9.4, unless otherwise specified.

### **2.4 ELECTRICAL AND MECHANICAL REQUIREMENTS**

- A. Standard UL / ETL / CSA listed materials, devices, and components shall be selected and installed in accordance with NEMA Standards and recommendations and as required for safe and efficient use and operation of the foodservice equipment without objectionable noise, vibration, and sanitation problems.
  - 1. Provide recognized commercial grade signals, "on-off" pushbuttons or switches, and other speed and temperature controls as required for operation of each item, complete

with pilot lights and permanent engraved, plastic laminate signs and graphics identifying each item. Provide stainless steel cover plates at controls and signals.

2. Each item requiring electrical power shall be equipped with either a terminal box for permanent connection or with cord and plug for interruptible connection, as indicated. Provide NEMA standard grounding type plugs, where used.
3. Furnish foodservice equipment completely wired internally using wire and conduit suitable for a wet location, including a separate grounding wire. Provide electrical outlets and receptacles required to be mounted on or in fabricated equipment and interconnect to a suitable terminal box (subpanel, starter, or disconnect switch if so specified) with all wires neatly tagged showing item number, voltage characteristics, and load information.
4. Receptacles for all wall- and floor-mounted outlets will be provided to be used for plug-in equipment with characteristics as noted on the drawings. Provide Hubbell three-wire or four-wire grounding-type connectors and neoprene cords installed on each item of plug-in equipment to match receptacles provided.
5. Electrically heated equipment shall be internally wired to a thermostatic control and an "on-off" red neon light indicator, which shall be mounted in a terminal box on a removable stainless steel access panel.
6. Only rigid steel zinc-coated conduit shall be used, painted to match adjacent surfaces where exposed. Wiring shall be run concealed wherever possible.
7. Provide on, or for, each motor-driven appliance or electrical heating or control unit, a suitable control switch or starter of the proper type and rating.

8. Appliances shall be furnished complete with motors, driving mechanism, starters, and controllers, including but not limited to, master switches, timers, cutouts, reversing mechanism, and other electrical equipment if and as applicable. Wiring and connection diagrams shall be furnished with electrically operated machines and for electrically wired fabricated equipment.
9. Appliances shall be of rigid construction, free from objectionable vibration. Quietness of operation of all foodservice equipment is a requirement. Remove or repair any equipment producing objectionable noise and/or vibration as directed by the Architect.
10. Motors shall be of the drip-proof, splashproof, or totally enclosed type, having a continuous duty cycle and ball bearings, except small timing motors which may have sleeve bearings. Motors shall have windings impregnated to resist moisture. Motors located where subject to deposits of dust, lint, or other similar matter from the machine on which installed shall be of the totally enclosed type. Motors shall have ample power to operate the machines for which designated under full load operating conditions without exceeding their nameplate ratings. Horsepower requirements on driven equipment shall be determined by the manufacturer based on normal operation at maximum capacity. The nominal rated motor horsepower shall be not less than the horsepower required for normal operation of the equipment at maximum capacity. Insulation shall be NEMA Class B, or better.
11. Cover plates shall be furnished and installed for all electrical outlets, receptacles, switches, etc., to match the material and finish of the equipment to which they will be fastened.
12. Switches, controls, etc., shall be conspicuously labeled as to use with plastic nameplates secured to the adjacent

surface as previously specified in Article 2.01-C. Submit a sample for approval if requested by Architect.

13. Where specified for custom fabricated equipment, provide compartment with electrical sub-panel which shall be pre-wired in conduit concealed in cabinet body construction and connected to all electrical components built into or set upon the counter. Electrical sub-panel shall be UL / ETL / CSA listed, 3-phase, 4-wire circuit breaker type with a ground buss main breaker and individual breakers for each serviced load. Buss shall be copper and the circuit breakers shall be the molded case, bolt-on type with thermomagnetic quick-make, quick-break trip. Multi-pole circuit breakers shall have an internal trip bar. The circuit breakers shall have an interrupting capacity of 10,000 amperes at 120 volts and there shall be a separate breaker for each connected load. Each breaker shall be sized for 125% of the connected load and a minimum of two (2) extra, single pole, 20 amp circuit breakers shall be provided. The loads shall be connected through the breakers in a phased sequence to balance the load on each phase.

- B. Water inlets shall be located above the positive water level wherever possible to prevent siphoning of liquids into the water supply system. Wherever conditions shall require a submerged inlet, a suitable type of check valve (except in jurisdictions where check valves are prohibited) and vacuum breaker shall be provided with the fixture to prevent siphoning. Where exposed, piping and fittings shall be chrome-plated. Where vacuum breaker piping is through equipment, provide chrome-plated escutcheon plates to cover holes.

1. Provide and install indirect waste lines from equipment which will discharge into floor drains or safe wastes, chrome-plated where exposed. Extend to a point at least 1" (25 mm) (or as required by local or state code) above the rim of the floor drain, cut bottom on 45° angle and secure in position.



2. Horizontal piping lines shall be run at the highest possible elevation and not less than 6" (150 mm) above the floor, through equipment where possible.
3. No exposed piping in or around fixtures or in other conspicuous places shall show tool marks or more than one thread at the fitting.
4. Steam operating valves on or in fabricated and purchased foodservice equipment shall be provided with composition hand wheels, which shall remain reasonably cool in service.
5. Provide suitable gas and liquid pressure-reducing valves for equipment with such components that might reasonably be expected to be affected over a period of time by adverse pressure conditions, including but not limited to dishwashers, booster heaters, coffee urns, ranges, steam boilers, etc.

C. Provide and install complete refrigeration systems -- charged, started, and operating properly -- including, but not limited to:

1. Compressors, condensers, racks, coils, vibration eliminators, sight glasses (moisture indicating type), expansion valves, filters, oil separators, thermostats, defrost time clocks, all controls and control wiring, liquid line driers, piping, and refrigeration grade copper tubing with all sweat joints using Safety-Silv No. 1200 or approved equal silver solder (with as few joints as possible).
2. Where specifications call for pre-piped lines (i.e., from a fixture to a valve compartment, etc.), provide such work in strict conformance with other sections of the specifications which set forth standards for this type of work or in conformity with the requirements of the ASHRAE Standards or local authorities, whichever is the greater.

3. Mechanically refrigerated cold pans shall have a normally closed liquid line electric solenoid valve installed before the expansion valve and wired to a silent-type toggle switch complete with an "on-off" red neon light indicator and both mounted in a terminal box on a removable access panel. This switch shall be fed by a separate control circuit and shall not to be wired into the compressor circuit so that it shall stop the flow of refrigerant to the cold pan and not turn off the compressor. The compressor shall then pump down and turn off through the action of the pressure control.
4. Each refrigeration item specification is written to provide minimum specifications and scope of work. Refrigeration equipment shall be designed and installed to maintain the following general temperatures unless otherwise specified.

a. Walk-In Refrigerators	1.7°C / 35°F
b. Walk-In Freezers	-23.3°C / - 10°F
c. Reach-In Refrigerators	1.7°C / 35°F
d. Reach-In Freezers	-23.3°C / - 10°F
e. Undercounter Refrigerators	1.7°C / 35°F
f. Undercounter Freezers	-23.3°C / - 10°F
g. Cold Pan	-17.8°C / 0°F
h. Work Rooms	10°C / 50°F

5. Provide electrical and refrigeration components needed by the completed system and complete all refrigeration and control connections of and to said components.
6. Provide evaporator coil defrost system on all walk-in refrigerator and freezer rooms where the refrigeration systems are designed to operate at room temperature of less than 35°F (1.7°C).

7. Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.
8. Verify and provide manufacturer's certification (or certification by manufacturer's authorized agent) that the equipment selection hereinafter specified for each refrigeration system is properly sized and shall meet the operating requirements set forth for each system regarding maintaining specified operating temperature, hours of compressor running time, and system pressures and velocities as recommended by the equipment manufacturer(s).
9. During check-out and initial operation, verify that:
  - a. Controls are properly adjusted.
  - b. Condensers are equipped with an overload protector.
  - c. A competent service mechanic is on site during the first eight (8) hours of operation.
  - d. Switches, starters, and controls are identified as to function.
10. Unless otherwise specified, furnish thermometers for walk-in units mounted above the exterior entrance door with suitable length armored capillary tubes to allow the sensing bulbs to be installed in the incoming air stream to the blower coil with runs fastened to the walk-in walls to prevent it from damage. This identical requirement applies to alarm systems when specified.

## **2.5 PRODUCT SPECIFICATIONS**

- A. Refer to Part 4 for complete itemized product specifications.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Begin installing the equipment at the time the building is ready to receive the equipment and in accordance with the schedule.
- B. Provide a competent foreman or supervisor for erection of equipment and to coordinate with other trades regarding connections, installation, and inspection. Coordinate delivery schedule to ensure adequate openings in the building to receive the equipment.
- C. Install refrigeration work in an approved manner, using first quality fittings, controls, valves, etc. Refrigeration items shall be started up, tested, adjusted, and turned over to the Architect in first-class condition and left operating in accordance with the manufacturer's specifications.
- D. Set equipment that rests on masonry bases level onto a bed of silicone rubber sealant.
- E. Seal equipment that butts to a wall or against other equipment with silicone rubber sealant. Set trim strips or other items requiring fasteners in a bed of silicone rubber sealant and fastened with suitable stainless steel fasteners 48" (1200mm) or less on centers. Surfaces shall be thoroughly clean and degrease all surfaces prior to the application of sealant.
- F. Install and interconnect electrical controls, switches, or other units which are separately furnished for field installation in or on equipment provided, unless otherwise specified.
- G. Install and wire refrigeration systems in strict conformance with the manufacturers' instructions and recommendations. Ensure that all refrigeration condensing units are ventilated properly and are accessible for repair, maintenance, and inspection.
- H. Hang evaporator coils per the manufacturer's recommendation at the locations as shown on the drawings. Mount units such that the drain pans are pitched to the drain lines. Hang the coils using nylon or other approved non-conductive, non-corrosive fasteners. Furnish #12 gauge galvanized steel fish plates of suitable size and shape on the exterior ceiling of the walk-in to spread the weight of the coils adequately. Connect coils to the condensing unit and install to constitute a complete

working system capable of maintaining the interior temperatures specified regardless of the heavy usage the walk-in units may receive.

- I. Furnish and install a copper or PVC drainline painted silver from each coil outlet to a point 1" (25mm) above the floor drain. Trap drainlines immediately above the floor drain. Provide continuous electrified heater tape for freezer drainlines, coordinate electrical requirements and wiring with electrical division. Insulate drainline after installation.
- J. Refrigeration tubing shall be the Type L, ACR hard drawn degreased, sealed copper and shall be installed with horizontal runs sloped 1" per 20 feet (1:240) toward the condensing units. Refrigerant piping shall be properly supported by adjustable hangers spaced and adjusted to the drop required. Where vertical runs of more than 5' (1500mm) occur in the suction line, trap the risers at the bottom. Install piping so refrigerant or oil cannot drain back into the coils from the suction line.
- K. Insulate suction and refrigerant lines with minimum 1/2" (13mm) Armstrong armaflex or equal cellular type insulation. Provide metal pipe sleeves where piping passes through a wall, ceiling, or floor. Fill space around the tubing with mastic insulating compound. Install a permanent suction line filter in each compressor suction line with pressure fitting ahead of the filter to facilitate checking of pressure drop through the filter. Fully insulate and seal penetrations through walk-in cooler or freezer structures to be vapor tight to prevent condensation within any light fixtures, switch boxes, junction boxes, or any other fittings. Fully seal refrigeration and drain lines and provide escutcheon plates.
- L. Furnish and completely install a thermostat to control the refrigeration temperatures for each individual compartment.
- M. Mount the condensing units on a welded steel rack containing all accessories and components necessary to form a complete condensing unit package. Provide each condensing unit with a factory mounted, pre-wired control panel/disconnect switch complete with circuit breakers, contactors, and time clocks as required.
- N. Furnish the refrigeration systems with a one-year refrigeration service contract, covering all parts and labor, with service available seven days per week, 24-hours per day. Provide an option for continuation of the service contract after the first year. Warrant the refrigeration system for one year and provide the compressors with the manufacturer's extended five-year warranty.

- O. Furnish four (4) copies of complete remote refrigeration system control wiring and piping diagrams. Frame one (1) copy in Plexiglas and mount at compressor location or inside the refrigeration system enclosure as appropriate.
- P. Coordinate the equipment work with the respective work of other Sections so that electrical and mechanical components built into the equipment will conform and/or adapt to the type, materials, and characteristics of the building components.
- Q. Install heated and motor-driven equipment so as to operate efficiently. Provide additional vents, guards, deflectors, and other accessories as needed at no additional cost. Note such additions or modifications on the shop drawings and bring to Architect's attention by special accompanying letter.

### **3.2 FABRICATION**

- A. Items of fabricated equipment shall be fabricated in the same factory and shall be similar in construction details, materials, methods, and appearance to similar types of items so fabricated under this contract.
- B. Each fabricated item of equipment shall include necessary reinforcing, bracing, and welding with the proper number and spacing of uprights and cross members for strength. Wherever standard sheet sizes will permit, the tops of all tables, shelves, exterior panels of cabinet type fixtures, and doors and drainboards shall be constructed of a single sheet of metal. Except where required to be removable, flat surfaces shall be secured to vertical and horizontal bracing members by welding or other approved means to eliminate buckle, warp, rattle, and wobble. Equipment not braced in a rigid manner and which is subject to rattle and wobble shall be unacceptable, and the Contractor shall add additional bracing in an approved manner to achieve acceptance.
- C. Suitable pipe slots shall be provided on fabricated equipment to accommodate service and utility lines and mechanical connections. These slots shall be of proper size and shall be neatly made with turned up edges around to eliminate cutting or defacing of equipment on the job. Cabinet bases shall be provided with an inner panel duct at the ends or rear of the cabinet allowing adequate space to conceal vertical piping. Such work, when performed at the job site, shall be of the same quality as similar work performed in the shop.

- D. Exposed surfaces shall be free from bolt and screw heads. When bolts are required, they shall be of the concealed type and be of similar composition as the metal to which they are applied. Where bolt or screw threads on the interior of fixtures are visible or may come into contact with hands or wiping cloths, they shall be capped with a stainless steel acorn nut and stainless steel lock washer.
- E. Where screw threads are not visible or readily accessible, they shall be assembled with stainless steel lock washers and nuts. Wherever bolts or screws are welded to the underside of trim or tops, the reverse side of the weld shall be finished uniformly with the adjoining surfaces. Depressions at these points shall not be acceptable.
- F. Rivets shall not be permitted in any location.
- G. Welding shall be the heliarc method with welding rod of the same composition as the sheets or parts welded. Welds shall be complete, strong, and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces. Welds shall be free of mechanical imperfections such as gas holes, pits, cracks, etc., and shall be continuously welded so that the fixtures shall appear as one piece construction. Butt welds made by spot solder and finished by grinding shall not be acceptable.
1. Spot welds shall have a maximum spacing of 3" (75mm). Tack welds shall be of at least 1/4" (6mm) length of welding material at a maximum space of 4" (100mm) from center to center. Weld spacing at the ends of the channel battens shall not exceed 2" (50mm) centers.
  2. In no case shall soldering be accepted.
  3. Fixtures shall be shop fabricated of one piece and shipped to the job completely assembled wherever possible. Equipment too large to transport or enter the building as one piece shall be constructed so that the field joints can be welded at the job site.
  4. Exposed joints shall be ground flush with adjoining material and finished to harmonize therewith. Whenever material has

been depressed by a welding operation, such depression shall be suitably hammered and peened flush with the adjoining surface and, if necessary, again ground to eliminate low spots. In all cases, the grain of rough grinding shall be removed by successive fine polishing operations.

5. Unexposed welded joints on undershelves of tables or counters in stainless steel construction shall be suitably coated at the factory with an approved metallic-based paint.

6. After galvanized steel members have been welded, welds and areas where galvanizing has been damaged shall have a zinc dust coating applied in conformance with U.S. Government Military Specification Number MIL-P-26915.

H. Butt joints and contact joints, wherever they occur, shall be close fitting and shall not require a filler. Wherever break bends occur, they shall be free of undue extrudence and shall not be flaky, scaly, or cracked in appearance; where such breaks do mar the uniform surface appearance of the material, such marks shall be removed by suitable grinding, polishing, and finishing. Wherever sheared edges occur, they shall be free of burrs, fins, and irregular projections and be finished to obviate danger of cutting or laceration when the hand is drawn over them. In no case shall overlapping materials be acceptable where miters or bullnosed corners occur.

I. The grain of polishing shall run in the same direction on horizontal and on vertical surfaces of each item of fabricated equipment except in the case where the finish of the horizontal sections of each shall terminate in a mitered edge. Where sinks and adjacent drainboards are equipped with backsplash, the grain of polishing shall be consistent in direction throughout the length of the backsplash and sink compartment.

J. Component parts, whether fabricated by the Contractor or purchased for building into the fabricated equipment, shall conform to the following.

1. Bolts, screws, nuts, and washers shall be of steel, except where brass or stainless steel is fastened, in which case they shall be of brass or stainless steel, respectively. Where dissimilar metals are fastened, bolts, screws, nuts,



and washers shall be of the higher grade metal. The spacing and extent of bolts and screws shall be such as to ensure suitable fastening and prevent buckling of the metals fastened.

### **3.3 CLEAN-UP**

- A. At completion of the installation, clean up, lubricate, and adjust where necessary items of equipment provided and turn them over in first-class condition.
  - 1. Where stainless steel surfaces are disturbed by the installation or fabricating process, such surface shall be finished to match adjoining undisturbed surfaces.
  - 2. At the completion of the installation work, stainless steel shall be gone over with a portable polishing machine and buffed to perfect surfaces. Painted surfaces shall be carefully gone over and retouched as required.

### **3.4 START-UP AND TESTING AND COMMISSIONING**

- A. Startup Services: Engage factory-authorized service representatives to perform startup services and to demonstrate and train Owner's maintenance personnel as specified below. This is for all kitchen equipment items listed in Part 4 of the Foodservice Equipment Specifications.
  - 1. Coordinate food service equipment startup with service-utility testing, balancing, and adjustments. Do not operate steam lines before they have been cleaned and sanitized.
  - 2. Remove protective coverings and clean and sanitize equipment, both inside and out, and relamp equipment with integral lighting. Where applicable, comply with manufacturer's written cleaning instructions.
  - 3. Test each equipment item for proper operation. Repair or replace equipment that is defective in operation, including units that operate below required capacity or that operate with excessive noise or vibration.

4. Test refrigeration equipment's ability to maintain specified operating temperature under heavy-use conditions. Repair or replace equipment that does not maintain specified operating temperature.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
6. Test motors and rotating equipment for proper rotation and lubricate moving parts according to manufacturer's written instructions.
7. Test water, drain, gas, steam, oil, refrigerant, and liquid-carrying components for leaks. Repair or replace leaking components.
8. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance for each food service equipment item.
9. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout."
10. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
11. Schedule training with Owner, through Architect, with at least 7 days advance notice.

### **3.5 SEISMIC RESTRAINTS**

- A. Install equipment in these contract documents according to the "SMACNA Guidelines for Seismic Restraint of Kitchen Equipment" in any State, province, or jurisdiction that has legislated this requirement as necessary for acceptance. This shall include:

1. Identifying these items on submittal drawings, Plans, Elevations, and Sections.
  2. Showing required SMACNA methods of restraint on submittal drawings.
  3. Referencing the appropriate detail(s).
  4. Obtain regulatory approval for all seismic engineering details.
- B. If no SMACNA detail exists for a particular situation, prepare and obtain approval for a special attachment detail:
1. Detail must be prepared by an engineer licensed by the State having jurisdiction over the project and accompanied by the supporting calculations used in the design.
  2. Verify that the restraint design is appropriate to the building's structural conditions and the surfaces to which the equipment will be secured.

**PART 4 - ITEMIZED PRODUCT SPECIFICATIONS**

- A. All items listed on the contract drawings under the heading "Foodservice Equipment Schedule" shall be furnished in strict accordance with the foregoing specifications and with the following detailed item specifications.
- B. Each model number includes the code \*C082 as a suffix. This code is known as the Specifier Identification System. It is not to be removed by the bidders. Its purpose is to identify the specifier to the vendors providing equipment in the event it is necessary to communicate questions, clarifications, and comments, from prior to bid award through final purchase. It is to be used on all correspondence including fax and email when communicating with manufacturer representatives and factories.

ITEM 001	Open Number	OPEN NUMBER *C082
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<b>ITEM 002</b>	<b>Front Counter 30" High</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 003</b>	<b>Work Counter</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 004</b>	<b>Sinks with Faucet</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 005</b>	<b>Double Wall Oven</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 006</b>	<b>Exhaust Hood</b>	<b>*C082</b>
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Provided By Contractor

Dimensions: As shown on plans with a typical hanging height of 6'-8" above finished floor.

Furnish and install a complete kitchen exhaust canopy. The hood shall be the "Capture Jet" system, Model KVE as manufactured by the HALTON Company of Scottsville, Kentucky. The canopy shall bear either the ETL or Underwriters Laboratories U.L. label, for listed range hood without exhaust fire damper per standard 710

and be fabricated in compliance with NFPA-96-2001, and shall bear the National Sanitation Foundation seal of approval.

The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes. The size shall be as indicated on drawings and/or equipment schedule.

The canopy exposed areas and inner liner shall be 18-gauge stainless steel with a #4 finish. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.

Hood lights shall be U.L. listed, energy efficient LED type and suitable for grease hoods as shown on plans. LED light fixtures shall have the following certifications U.L., CSA, NSF and CE, for use in grease exhaust hoods in quantity sufficient to provide 50 foot candles (as shown on plans) at the cooking surface when hood is mounted 84" A.F.F. LED light fixture shall be complete with die-cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24Vdc with a power consumption not to exceed 20 watts. The housing encases 24 LED light emitters with a brightness of 1000 lumens. The lamp body is a stainless steel ring with a high temperature silicone seal. The wiring junction box shall accept standard 1/2" NPT fitting. Fixture shall come complete with integral power supply with an input voltage of 108VAC - 305VAC and input frequency of 50/60 Hz. The input current rating for each individual power supply (located and shown on plans) shall be 0.57A @ 120VAC. Fixture shall contain no mercury or lead.

The exhaust airflow will be based on the convective heat generated by the appliances underneath each canopy. Submittal shall include convective heat calculations base on the input power of the appliance served as defined by ASTM Standards F-1704-05 Capture & Containment and F-2474-05 Heat Gain to Space. Final air volume calculations shall comply with the hood listing.

Hood will include an active internal "Capture-Jet" System that will allow for Capture and Containment of thermal plume at specified air volumes. The Capture Jet air shall be pulled into a 1" air plenum with the Capture-Jet fan and discharged through Capture-Jet ports that are located along the inside front, side and bottom edge of the hood at discharge velocity of 1800 FPM. Slot type, passive devices or "Short-Cycle" discharge is not acceptable.

The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. The grease extraction efficiency is 93% on particles with a diameter of 5 microns and 98% on particles with a diameter of 15 microns or larger, based upon ASTM F-2519-05 method of test. Sound levels shall be between 40 and 55 NC.

Hood shall include fan and light switch on front face of hood with a pilot light to indicate when fan is "on", as shown on

drawings. Additionally, hood shall include a temperature sensor and timer circuit to engage exhaust fan when appliances are used and exhaust fan is not operating. This will serve as the interlock required by IMC 507.2.1.1.

The air flows through the KSA extractors and the Capture Jet air chamber are to be determined through the integral T.A.B. (Testing and Balancing) ports mounted in the hood. It is the responsibility of the air balancer to adjust the exhaust volumes after installation with a Magnahelic Gauge or Shortridge Digital Anemometer and the hood TAB ports.

The Capture Jet hood will come standard with the Halton AccuFlow indicator. The AccuFlow provides a visual indicator that the system is at design exhaust air values. A pressure transducer measures design exhaust rate and this is interpreted by the AccuFlow sensor by a steady green indicator light. Should the system be below design airflow, the indicator light will blink once in sequence. Should the indicator light blink twice in sequence, the exhaust airflow is above design.

#### Performance Criterion

Other manufacturers wishing to offer an alternate to the specified manufacturer must apply for permission to do so, in writing, from the office of the specifying consultant. The consultant must receive application at least ten working days prior to the bid date. Any alternate system must meet construction and performance requirements and efficiencies as outlined in this specification. Requests for approval must include grease filtration performance data (micron size vs. extraction) for mechanical extractor and manufacturer's own exhaust airflow calculations based on convective heat load of cooking equipment beneath the hood. Efficiency comparison data to be performed in accordance with ASTM Standard F1704-96 and include results for exhaust rate for capture and containment of convective plume, Temperature rise of exhaust air and Heat Gain to the space (kBtu/h). Make up air will be calculated so that the same amount of air will be taken from the zone as is required by the specified system. An additional load cannot be placed on the kitchen HVAC system. Manufacturer must provide a written guarantee of performance, ensuring the specifying consultant that the system will perform to the consultant's satisfaction when installed and balanced according to design airflows and results of ASTM Standard F1704-96 test. (As determined by TAB ports and pressure vs. air flow curves). Consultant reserves the right to reject any system which, when installed, does not perform to ASTM Standard F1704-96 for heat gain according to the specification. Rejected system must be replaced with specified system, with all replacement costs paid by manufacturer of rejected system. Any changes in the specified sizing of power wiring or gas lines due to the use of any system other than that which is specified is the responsibility of the alternate hood manufacturer, and must be coordinated by the hood manufacturer and contractors involved.

Specification based on Halton Model Custom Fabricated or approved equal

<b>ITEM 006A</b>	<b>Fire Suppression System</b>	<b>*C082</b>
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Provided By Contractor

This item shall provide coverage for item 006

Furnish a complete wet chemical fire suppression system model R102 as manufactured by "Ansul" or equal in compliance with U.L. 300 standards. The system shall include factory prepiped, all permits and test as required by the authority having jurisdiction.

Automatic actuation shall be by means of fusible with no visible conduit.

System shall be furnished and installed by an Ansul certified distributor in accordance with manufacturer's instructions and the authority having jurisdiction.

Microswitches shall be furnished as part of the fire protection system for tie in of building alarm and for make up air/fire/fuel shut down.

All access openings, holes, sleeves, chases, etc., in building structure necessary to permit piping and control tubing to be run between system unit, ventilator and duct work are to be provided by the General Contractor.

The Building Alarm System Contractor is to furnish a control relay to detect operation of the system by connection to the microswitches supplied. The Electrical Contractor is to furnish and install all wiring required for the system specified.

Notes:

- (1) All exposed piping and nozzles of fire protection system shall be chrome or Stainless steel sleeved.
- (2) All horizontal piping is to be done on the top of the ventilator unless otherwise specified.

Specification based on Ansul Model **R-102 or approved equal**

<b>ITEM 007</b>	<b>Electric Cooktop</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 008</b>	<b>Refrigerator/Freezer</b>	<b>*C082</b>
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Provided By Government

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 009</b>	<b>Beverage Counter</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 010</b>	<b>Cabinets</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 011</b>	<b>Waste Disposer</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 012</b>	<b>Waste Container</b>	<b>*C082</b>
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Provided By Government

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 013</b>	<b>Hand Sink with Faucet</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000  
Specifications

<b>ITEM 014</b>	<b>Front Counter</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000  
Specifications

<b>ITEM 015</b>	<b>Work Counter</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000  
Specifications

<b>ITEM 016</b>	<b>Work Counter</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000  
Specifications

<b>ITEM 017</b>	<b>Under Counter Microwave</b>	<b>*C082</b>
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Provided By Government

This item is not part of the Food Service Equipment Section 114000  
Specifications

<b>ITEM 017A</b>	<b>Open Number</b>	<b>*C082</b>
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<b>ITEM 018</b>	<b>Holding/Retherm Unit</b>	<b>*C082</b>
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Provided By Government

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 019</b>	<b>Work Table</b>	<b>*C082</b>
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Provided By Government

Work Table, 24" wide top, without splash, 60" long, with adjustable under shelf, s/s frame & shelf, 14 gauge, type 304 stainless steel top, with countertop non drip edge, 16 gauge type 304 s/s legs with s/s bullet feet

Model US-24-60 Work Table Under shelf, 18 gauge 430 stainless steel, 24" wide, 5 feet long

TA-25 Casters, 5", swivel, with rubber wheels (set of 4; 2 with brakes)

Specification based on Advance Tabco Model VSS-244 or approved equal

<b>ITEM 020</b>	<b>Coffee Brewer</b>	<b>*C082</b>
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Provided By Government

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 021</b>	<b>Dishwasher, Undercounter</b>	<b>*C082</b>
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Provided By Contractor

Undercounter Dishwasher, Hot Water Sanitation, 30 Racks/Hour, Fresh Water Rinse, Delime Notification, Service Diagnostics, With 70 Deg. Booster Heater and Pump Capability, Detergent and Rinse Aid Pumps, ENERGY STAR®

DISHRAK-PEG20 Peg rack

DISHRAK-COM20 Combination rack

KEC to coordinate with Millwork Contractor

KEC to install under Front Counter, Item 003, as per plan

Specification based on Hobart Model LXIH-4 or approved equal

<b>ITEM 022</b>	<b>Hand Sink</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 023</b>	<b>Refrigerator, Reach-in</b>	<b>*C082</b>
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Provided By Government

Spec-Line Refrigerator, Reach-in, 24" wide, self-contained refrigeration, stainless steel exterior and interior, standard depth, full-height door, INTELA-TRAUL™ microprocessor controls

Cord and plug attached

Doors hinged as shown on plan with locks mastered keyed to all other refrigerated cabinets

Casters, 6" high (set of 4)

Universal trayslides on 4" centers - top section

Chrome plated shelves on bottom section

Specification based on Traulsen Model RHT132DUT-FHS or approved equal

<b>ITEM 024</b>	<b>Freezer, Reach-in</b>	<b>*C082</b>
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Provided By Government

Spec-Line Freezer, Reach-in, 24" wide, self-contained refrigeration, stainless steel exterior and interior, standard depth, full-height doors, INTELA-TRAUL™ microprocessor controls

Casters, 6" high (set of 4)

Cord and plug attached

Doors hinged as shown on plan with locks mastered keyed to all other refrigerated cabinets

Universal trayslides on 4" centers - top section

Chrome plated shelves on bottom section

Specification based on Traulsen Model RLT132DUT-FHS

<b>ITEM 025</b>	<b>Wall Shelf</b>	<b>*C082</b>
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Provided By Contractor

Custom Fabricated 1'6" Long by 6'0" Wide, constructed and equipped per Plan, and Detail 1.13

Edge per detail 1.02A

KEC to provide shop drawings for approval prior to ordering.

Specification based on Custom Fabricated Model STD DTL 1.13 or approved equal

<b>ITEM 026</b>	<b>Coffee Brewer</b>	<b>*C082</b>
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Provided By Government

Hot Beverage Dispenser, (3) 8 lb. hoppers, 4.5 gallon/hr capacity, lit front graphics, 4.4 gallon hot water tank, 7.25" cup clearance, high-speed, heavy-duty whipper, key lock on door, low product detection system, digital technology, spring-loaded, auger motor,

Cord and Plug attached

Interconnect to water line from Item 3.082A Water Filter

Specification based on Model Bunn Model IMIX-3-0001 or approved equal

<b>ITEM 026A</b>	<b>Water Filter</b>	<b>*C082</b>
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Provided By Contractor

Filter to improve taste, provide safe/clean ingredient water

Rated Capacity: \*Chlorine: 50,000 gallons @ 5 gpm

Chloramine: 15,000 gallons @ 2.5 gpm

- Flow Rate: 5 gpm
- Min/Max Pressure: 40-125 psi.
- Min/Max Temperature: 40°-100° F
- Inlet/Outlet Size: 1/2 Inch Barbed Fitting
- Dimensions (WITHD/H): 17/9/18"

Interconnect to water line to Item 026 and 027, Coffee Brewer and Juice Dispenser

Specification based on Selecto Scientific Model CoffeeTea pro or approved equal

<b>ITEM 027</b>	<b>Juice Dispenser</b>	<b>*C082</b>
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Provided By Government

2-Flavor Cold Beverage System, (4) 5 oz. drinks/min capacity, modular dispense deck, 8 lb. ice bank, 7" cup clearance, dispense 1.0 to 1.5 ounces per second flow rate, pumps and mixes 2+1 to 11+1 concentrated beverages, 4+1 high viscosity and 5+1 juices, dispenses frozen and ambient products, High Intensity™ mixing technology, push button and single portion control, juice display, air filter,

Cord and Plug attached

Interconnect to water line from Item 026A Water Filter

Specification based on Bunn Model JDF-2S-0001 or approved equal

<b>ITEM 028</b>	<b>Blender</b>	<b>*C082</b>
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Provided By Government

Vita-Prep® 3 Commercial Food Blender, variable speed, 64 oz. (2.0 liter) high-impact, clear container with wet blade, black base, 54 page recipe and technique guide, cUL listed, NSF certified

1195 Blender Container, 64 oz. (2 liter), high-impact, clear, with wet blade assembly and lid, for Vita-Pro® and Vita-Prep®, NSF certified

Specification based on Vita-Mix Model 1005 or approved equal

<b>ITEM 029</b>	<b>Soap and Towel Dispenser</b>	<b>*C082</b>
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Provided By Government

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 030</b>	<b>Cabinet with Doors</b>	<b>*C082</b>
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Provided By Contractor

This item is not part of the Food Service Equipment Section 114000 Specifications

<b>ITEM 031</b>	<b>Ice Maker Dispenser</b>	<b>*C082</b>
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Provided By Government

Ice Maker & Dispenser, Flake-Style, counter model, air-cooled, self-contained condenser, 453-lb production/24 hours w/12 lb. storage, polyurethane interior, stainless steel exterior,

Cord and Plug attached

Interconnect to water line from Item 031A Water Filter

Specification based on Scotsman Model MDT4F12A-1 or approved equal

<b>ITEM 031A</b>	<b>Water Filter, Ice</b>	<b>*C082</b>
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Provided By Contractor

Filter to improve taste, provide safe/clean ingredient water

Rated Capacity: \*Chlorine: 50,000 gallons @ 5 gpm

Chloramine: 15,000 gallons @ 2.5 gpm

- Flow Rate: 5 gpm
- Min/Max Pressure: 40-125 psi.
- Min/Max Temperature: 40°-100° F
- Inlet/Outlet Size: 1/2 Inch Barbed Fitting
- Dimensions (WITHD/H): 14/9/19"

Interconnect to water line to Item 031, Ice Dispenser

Specification based on Selecto Scientific Model SMF ICEPRO or approved equal

## **PART 5 - SCHEDULE OF STANDARD DETAILS**

- A. The following Standard Details are hereby made a part of these specifications and shall be utilized for referenced design requirements.

1.02	Edges
1.02.1	Edges
1.03	Corner Guards
1.13	Wall & Shelf Support



**SECTION 11 44 00**  
**FOOD COOKING EQUIPMENT**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

A. This section specifies food service cooking equipment that is Owner Furnished and Contractor Installed, as follows:

1. Electric double built-in oven.
2. Undercounter microwave.
3. Refrigerator/Freezer.
4. Waste container.
5. Electric cooktops.
6. Coffee Maker (Owner furnished and Owner installed).

**1.2 RELATED WORK**

- A. Plumbing Connections: Section 22 05 19, METERS AND GAGES FOR PLUMBING PIPING, Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING , Section 22 11 00, FACILITY WATER DISTRIBUTION, Section 22 13 00, FACILITY SANITARY SEWERAGE, Section 22 13 23, SANITARY WASTE INTERCEPTORS, Section 22 14 00, FACILITY STORM DRAINAGE.
- B. Electrical Connections: Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS, and Section 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS.
- C. Electrical Disconnect Switches: Section 26 29 21, DISCONNECT SWITCHES.

**1.3 QUALITY CONTROL**

- A. Installer Qualifications: Experienced in food service equipment installation or supervised by an experienced food service equipment installer:
1. Where required to complete equipment installation, electrician and plumber shall be licensed in jurisdiction where project is located.
- B. NSF Compliance: Equipment bears NSF Certification Mark or UL Classification Mark indicating compliance with NSF/ANSI 4E.
- C. UL Listing: Equipment is listed in UL "Heating, Cooling, Ventilating and Cooking Equipment Directory" and is labeled for intended use.
1. Electric Cooking Equipment: Evaluated according to UL 197.
- D. Steam-Generating Equipment: Fabricated and labeled to comply with ASME BPVC.

- E. In-Use Service: At least one factory-authorized service agency for equipment shall be located in the geographical area of the installation and shall have the ability to provide service within 24 hours after receiving a service call.

#### **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. Include manufacturer's address and telephone number.
  - 2. Include catalog or model numbers and illustrations and descriptions of cooking equipment.
  - 3. Proof of appliances being Energy Star qualified where applicable.
- C. Installation Drawings: Show dimensions, details of installation, coordination with plumbing and electrical work, and other work required for a complete installation.
- D. Operating Instructions: In accordance with requirements in Section 01 00 00, GENERAL REQUIREMENTS.

#### **1.5 WARRANTY**

Warrant food service equipment to be free from defects in materials and workmanship in accordance with requirements of "Warranty of Construction", FAR clause 52.246-21.

#### **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 National Standards Institute/Canadian Gas Assoc. (ANSI/CGA):  
Z83.11-06.....Gas Food Service Equipment
- C. ASME International (ASME):  
BPVC-07.....Boiler and Pressure Vessel Code
- D. NSF International/American National Standards Institute (NSF/ANSI):  
4E-07.....Commercial Cooking, Rethermalization, and  
Powered Hot Food Holding and Trans Equipment
- E. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): Publication 1767  
Kitchen Ventilation Systems and Food Service Equipment Fabrication and  
Installation Guidelines, 2001
- F. Underwriters Laboratories Inc. (UL):

## **PART 2 - PRODUCTS**

### **2.1 ELECTRIC DOUBLE BUILT-IN OVEN (ITEM 005)**

Product:

1. Jenn-Air, 30" wide, electric, double, built-in oven.

### **2.2 UNDERCOUNTER MICROWAVE (ITEM 017)**

Product:

1. Jenn-Air, 21-19/32" wide, undercounter microwave, model JMD2124W.

### **2.3 INTEGRATED REFRIGERATOR/FREEZER (ITEM 008)**

Product:

1. Sub-Zero, 36" Integrated Combination Tall refrigerator/freezer, model 736TCI.

### **2.4 WASTE CONTAINER (ITEM 012)**

Product:

1. Rubbermaid, 3540 Slim Jim Waste Container, color: Black.

### **2.5 ELECTRIC COOKTOPS (ITEM 007)**

Products:

1. Miele Series CombiSet Program, Narrow Width Units: (2) - 1112 E Ceramic Double Burner; (1) - CS 1312 BG Barbecue; (1) - CS 1326 Y Tepan Yaki; (3) - CSZL 1500 Connecting Strips.

### **2.6 COFFEE MAKER (ITEM 020-ITEM TO BE PURCHASED BY OWNER AND INSTALLED BY OWNER)**

Product:

1. Cuisinart Black 12-Cup Programmable Coffee Maker.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install cooking equipment level and plumb; arranged for safe and convenient operation; with access clearances required for maintenance and cleaning; and according to manufacturer's written instructions.
- B. Interconnect cooking equipment to service utilities.

### **3.2 CLEAN-UP**

- A. At completion of the installation, clean and adjust cooking equipment as required to produce ready-for-use condition.

B. Where stainless-steel surfaces are damaged during installation procedures, repair finishes to match adjoining undamaged surfaces.

### **3.3 INSTRUCTIONS**

Instruct personnel and transmit operating instructions in accordance with requirements in Section 01 00 00, GENERAL REQUIREMENTS.

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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 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.....Medical Electrical Equipment: General  
Requirements for Safety  
94-2006.....UL Standards for Safety Test for Flammability of  
Plastic Materials for Parts in Devices and  
Appliances-Fifth Edition
- D. International Electromagnetic Commission (IEC):  
801-2(1991).....Electromagnetic Compatibility for Industrial-  
Process Measurement and Control Equipment-Part  
2: Electromagnetic Discharge Requirements

## **PART 2 - PRODUCTS**

### **2.1 CEILING TRACK SYSTEM**

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. The Basis-of-Design Product shall be as manufactured by MedCare Equipment Company, similar, or equal to, item 323102 (lift capacity up to 450 lbs.), and item 323120 (lift capacity up to 625 lbs.).
- B. The Lift system shall have the following features.
  - 1. Electronic soft-start and soft-stop motor control
  - 2. Emergency lowering device
  - 3. Emergency stopping device
  - 4. Current limiter for circuit protection in case of overload.

5. Safety device that stops the motor to lift when batteries are low.
6. Lifting speed: 2.3in/s (6 cm/s), 1.6in/s (3.5cm) in full capacity
7. Horizontal displacement speed: 5.9in/s (150mm/s)
8. Horizontal axis motor: 24VDC at 62 watts and vertical axis motor at 110 watts
9. Emergency brake (in case of mechanical failure)
10. Strap length up to 90in (2.3m) tested for 2998lbs (1360kg)
11. Cab: VO plastic-fire retardant, UL 94
12. 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 COTR 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 11 80 00  
TOWEL WARMING DRAWER**

**PART 1 - GENERAL**

**1.1 SUMMARY**

This Section includes towel warming drawers for the spa room millwork.

**1.2 RELATED WORK**

Millwork in Section 06 20 00, FINISH CARPENTRY.

**1.3 SUBMITTALS**

- A. Product Data: For product indicated.
- B. Shop Drawings: Identify location of warming drawer in millwork shop drawings.
- C. Operation and maintenance data.

**1.4 WARRANTY**

Warrant towel warming drawers to be free from defects in materials and workmanship in accordance with requirements of "Warranty of Construction," FAR clause 52.246-21.

**PART 2 - PRODUCTS**

**2.1 TOWEL WARMING DRAWERS**

- A. Towel Warming Drawers: Basis-of-Design Product: 24" Home Spa Towel Warming Drawer, as manufactured by Jacuzzi Whirlpool Bath, or COTR approved equal.
  - 1. Function/Features: Slide out drawer; On/OFF switch; Thermal High Temp cutout; Dry heat; Stainless Steel components; Drawer close latch.
  - 2. Electrical Specifications: 120 VAC, 15 AMP, 60 Hz dedicated GFCI protected separate circuit.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

Install each towel warming drawer according to manufacturer's written instructions.

### **3.2 FIELD QUALITY CONTROL**

#### **A. Tests and Inspections:**

1. Perform installation and startup checks according to manufacturer's written instructions.

#### **B. A towel warming drawer will be considered defective if it does not pass tests and inspections.**

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**SECTION 12 24 00**  
**WINDOW SHADES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

Venetian blinds and roller window shades are specified in this section. Window shades shall be furnished complete, including brackets, fittings and hardware.

**1.2 RELATED WORK**

- A. Wood Blocking: Section 06 10 00, ROUGH CARPENTRY, for wood blocking and grounds for mounting roller shades and accessories.
- B. Color of exposed parts of venetian blinds, (including tapes and cords): Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 QUALITY CONTROL**

Manufacturer's Qualification: Venetian blind and vertical blind manufacturer shall provide evidence that the manufacture of blinds are a major product, and that the blinds have performed satisfactorily on similar installations.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
  - 1. Shade Material: not less than 76 mm (12-inch) square section of fabric. Mark face of material.
  - 2. Venetian blind slats, 300 mm (12 inches) long, including cord and tape, showing color and finish.
- C. Manufacturer's literature and data; showing details of construction and hardware for:
  - Venetian blinds
  - Roller window shades
- D. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining roller shades and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
  - 3. Operating hardware.

## **1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced to in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
  - AA-V-00200B.....Venetian Blinds, Shade, Roller, Window, Roller, Slat, Cord, and Accessories
- C. American Society for Testing and Materials (ASTM):
  - A167-99 (R2004).....Stainless and heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
  - B221/B221M-07.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
  - D635-06.....Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
  - D648-07.....Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
  - D1784 Rev.A-06.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Roller Shade Cloth: translucent material.
- B. Stainless Steel: ASTM A167.
- C. Cords for Venetian Blinds: No. 4 braided nylon or No. 4-1/2 braided cotton having not less than 175 pounds breaking strength.
- D. Extruded Aluminum: ASTM B221/B221M.

### **2.2 ROLLER WINDOW SHADES**

PVC-coated fiberglass, providing a 10% openness factor with basketweave pattern; shade cloth units to fill window openings from head to sill, and jamb to jamb; shade cloth shall hang flat without buckeling or distortion, with hem sealed, trimmed edges to hang straight without curling or raveling; unguided shade cloth shall roll true and straight without shifting sideways more than 1/8" to either side per 8 feet of shade height; include bottom hem weights and concealed hem tube; trim: as indicated by manufacturer's designation for style and color; rollers: electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal

components of operating system and the weight and width of shade band material without sagging; provide shade hardware system that allows for field adjustment of any operable components without requiring removal of brackets; Pocket-Style head box similar to Basis-of-Design product, System 5 with removable fascia, by MechoShade Systems, or COTR approved equal; direction of roll from back of roller; manual shade operation with continuous-loop bead chain, clutch, and chord tensioner and steel support brackets, fully independent of shade tube assembly.

### **2.3 VENETIAN BLINDS**

Fed. Spec. AA-V-00200, Type I, 50 mm (two inch slat) fabricated of PVC-free plastic. Pre-production sample is not required.

### **2.4 FASTENINGS**

Zinc-coated or cadmium plated metal, aluminum or stainless steel fastenings of proper length and type. Except as otherwise specified, fastenings for use with various structural materials shall be as follows:

Type of Fastening	Structural Material
Wood screw	Wood
Tap screw	Metal
Case-hardened, self-tapping screw	Sheet Metal
Screw or bolt in expansion shields	Solid masonry
Toggle bolts	Hollow blocks, wallboard and plaster

### **2.5 FABRICATION**

- A. Fabricate roller window shades and venetian blinds to fit measurements of finished openings obtained at site.
- B. Venetian Blinds: Venetian blinds shall have 50 mm (two inch) width horizontal slats positioned within ladder tapes. Multiple blinds in openings are to be of same type and divided at mullions.
  1. Head-rails shall fully enclose operating mechanism on three sides and ends.
  2. Bottom rails shall be fully enclosed to prevent contact of tapes and sill at underside.
  3. In lobbies, bottom rails and head boxes shall be aluminum.

4. Finish concealed metal work of head-rails including concealed mechanism, with one shop coat of paint. Do not paint parts that have non-rusting finish, or parts where motion of friction occurs.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Roller Window Shades: Install roller shades level, plumb, and aligned units according to manufacturer's written instructions, and located so shade band is not closer than 50 mm (2 inches) to interior face of glass; adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range; clean roller shade surfaces after installation, according to manufacturer's written instructions; replace damaged roller shades that cannot be repaired, in a manner approved by the COTR, before time of Substantial Completion.
- B. Venetian Blinds: Support blinds in level position by brackets and intermediate supports that will permit easy removal and replacement of units without damage to blind, or adjacent surfaces. Provide at least two fasteners for each bracket or other support.
  1. Install blinds between jambs on window openings with steel trim. Mount brackets on trim reveal, flush with face of trim and secure with steel screws.
  2. Mount brackets and intermediate supports of lobby blinds on face of trim members, and secure with stainless steel standard tap or thread-forming machine screws, or by cadmium-plated molley or toggle bolts. Screws and bolts shall penetrate through and lock behind steel sub-frame.
  3. Where blinds abut glass partitions of Vestibules, extend head rails to trim at head of partition frame with slats sufficiently long to clear transom bars.
  4. Provide one brush (for each 1 to 50 blind) of an approved type, suitable for cleaning blinds.

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**SECTION 12 32 00**  
**MANUFACTURED WOOD CASEWORK**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies wood veneer casework and plastic laminate casework as detailed on the drawings, including related components and accessories required to form integral units. Wood casework items shown on the drawings, but not specified below shall be included as part of the work under this section, and applicable portions of the specification shall apply to these items. Each like item of casework shall be of the same design and by one manufacturer.

**1.2 RELATED WORK**

- A. Custom Casework: Section 06 20 00, FINISH CARPENTRY.
- B. Color and Finish of Plastic Laminate: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Lavatories and Plumbing in Casework: Section 22 40 00, PLUMBING FIXTURES.

**1.3 MANUFACTURER'S QUALIFICATIONS**

The fabrication of casework shall be by a manufacturer who produces casework similar to the casework specified and shown.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - Locks for doors and drawers
  - Adhesive cements
- C. Samples:
  - Counter top, plastic laminate, 150 mm (six inch) square
  - Wood Face Veneer or Hardwood Plywood
- D. Shop Drawings (1/2 full size):
  - 1. All casework, showing details of construction, including materials, hardware and accessories.
  - 2. Cabinets and counters showing faucets in connection with sink bowls, and electrical fixtures and receptacles which are mounted on cabinets and counters.
  - 3. Fastenings and method of installation.

## 1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - A167-99 (R2004).....Stainless and Heat-Resisting chromium-Nickel Steel Plate, Sheet and Strip
  - A1008-07.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy
  - C1036-06.....Flat Glass
- C. Composite Panel Association (CPA):
  - A208.1-99.....Particleboard
- D. U.S. Department of Commerce Product Standards (Prod. Std):
  - PS1-95.....Construction And Industrial Plywood
- E. Hardwood, Plywood and Veneer Association (HPVA):
  - HP.1-04.....Hardwood and Decorative Plywood
- F. Architectural Woodwork Institute (AWI):
  - Architectural Woodwork Quality Standards, Guide Specifications Quality Certification Program - 1999
- G. American Society of Mechanical Engineers (ASME):
  - A112.18.1-05.....Plumbing Fixture Fittings
- H. National Electrical Manufacturers Association (NEMA):
  - LD3-05.....High Pressure Decorative Laminates
  - LD3.1-95.....Performance, Application Fabrication and Installations of High-Pressure Decorative Laminates
- I. Hardwood Plywood and Veneer Association
  - HP-1.....Hardwood and Decorative Plywood

## PART 2 - PRODUCTS

### 2.1 PLYWOOD, HARDWOOD FACE VENEER

HPVA HP-1, Premium Grade plain sliced Maple. Book-matched veneer panels in base cabinets.

### 2.2 PLASTIC LAMINATE:

- A. NEMA LD-3.
- B. Exposed decorative surfaces including countertops, both sides of cabinet doors, and for items having plastic laminate finish. General purpose Type HGL.
- C. Cabinet Interiors Including Shelving: Both of following options to comply with NEMA, LD3.1 as a minimum.
  - 1. Plastic laminate clad plywood or particle board.



2. Resin impregnated decorative paper thermally fused to particle board.
- D. Backing sheet on bottom of plastic laminate covered wood tops. Backer Type BKL.
- E. Post Forming Fabrication, Decorative Surface: Post forming Type HGP.

### **2.3 PLYWOOD, SOFTWOOD**

Prod. Std. PS1, five ply construction from 13 mm to 28 mm (1/2 inch to 1-1/8 inch) thickness, and seven ply for 31 mm (1 1/4 inch) thickness.

### **2.4 PARTICLEBOARD**

CPA A208.1, Type 1, Grade 1-M-3.

### **2.5 GLASS: ASTM C1036**

For Doors: Type I, Class 1, Quality q4.

### **2.6 SOLID WOOD**

Wood required for edge banding, moldings, and legs shall be of same species as wood face veneer.

### **2.7 SHEET STEEL**

ASTM A1008.

### **2.8 STAINLESS STEEL**

ASTM A167, with No. 4 finish.

### **2.9 HARDWARE**

- A. Where pin tumbler locks are specified, disc tumbler lock "Duo A", with brass working parts and case, as manufactured by the Illinois Lock Company will be an acceptable substitute. Locks for each type casework, shall be keyed differently and shall be master-keyed for each type service, such as Nurses, Psychiatric, and Administration. Provide two keys for each lock. Exposed hardware, except as otherwise specified, shall be satin finished chromium plated brass or nickel plated brass.
- B. Marking of Locks and Keys:
1. The name of the manufacturer, or trademark by which manufacturer can readily be identified, legibly marked on each lock.
  2. The key change number marked on the exposed face of lock, and also stamped on each key.
  3. Key change numbers shall provide sufficient information for replacement of the key by the manufacturer.
- C. Hinged Doors:
1. Doors 900 mm (36 inches) and more in height shall have three hinges and doors less than 900 mm (36 inches) in height shall have two hinges. Each door shall close against two rubber bumpers.
  2. Hinges: Fabricate hinges with minimum 2 mm (0.072 inch) thick chromium plated steel leaves, and with minimum 3.5 mm (0.139 inch)

- diameter stainless steel pin. Hinges shall be five knuckle design with 63 mm (2-1/2 inch) high leaves and hospital type tips.
3. Fasteners: Provide full thread wood screws to fasten hinge leaves to door and cabinet frame. Finish screws to match finish of hinges.
- D. Door Catches:
1. Friction or Magnetic type, fabricated with metal housing.
  2. Provide one catch for cabinet doors 1200 mm (48 inches) high and under, and two for doors over 1200 mm (48 inches) high.
- E. Locks:
1. Cylinder type pin tumbler.
  2. Equip doors and drawers where shown with locks.
- F. Drawer and Door Pulls:
- Doors and drawers shall have flush pulls, fabricated of either chromium plated brass, chromium plated steel, stainless steel, or anodized aluminum.
- G. Drawer Slides:
1. Full extension steel slides with nylon ball-bearing rollers.
  2. Slides shall have positive stop.
  3. Equip drawers with rubber bumpers.
- H. Sliding Doors:
1. Each door shall be supported by two ball bearing bronze or nylon rollers, or sheaves riding on a stainless steel track at top or bottom, and shall be restrained by a nylon or stainless steel guide at the opposite end.
  2. Plastic guides are not acceptable.
  3. Each door shall have rubber silencers set near top and bottom of each jamb.
- I. Shelf Standards (Except For Fixed Shelves):
- Bright zinc-plated steel for recessed mounting with screws, 16 mm (5/8 inch) wide by 5 mm (3/16 inch) high providing 13 mm (1/2 inch) adjustment, complete with shelf supports.
- J. Gate Bolt:
- Surface mounted barrel type with strike.
- K. Hinged Gates:
- Gates shall have two double-acting hinges , size as required.

## **2.10 FABRICATION**

- A. Casework shall be of the flush overlay design and, be of premium grade construction and of component thickness in conformance with AWI Quality Standards.

- B. Fabricate casework of plastic laminated covered plywood or particleboard and factory finished wood veneer as follows:
  - 1. Where shown, doors, drawers, shelves, all semi-concealed surfaces shall be plastic laminated.
  - 2. Glazed doors shall have 5 mm (3/16 inch) thick glass, set in glazing compound.
- C. Base:
  - 1. Provide rubber or vinyl base with close, flush joints; set with adhesive.
  - 2. Remove adhesive from exposed surfaces.
  - 3. Install base at floor line after casework has been accurately leveled.
  - 4. Rub base to glossy finish.
- D. Countertops:
  - 1. Countertops, splashbacks shall be plastic laminate factory glued to either a plywood (PS1), or particleboard (CPA A208.1) core.
  - 2. Countertops shall be 1-1/4 inches thick.
  - 3. Splashbacks shall be finished 19 mm (3/4 inch) thick and be secured to countertops with concealed metal fastenings and with contact surfaces set in waterproof adhesive.
  - 4. Provide cut-outs for plumbing trim where shown.
  - 5. Cover exposed edges of countertops, splashbacks with plastic.
- E. Support Members for Tops of Tables:
  - 1. Construct as detailed.
  - 2. Provide miscellaneous steel members and anchor as shown.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Set casework in place; level, plumb and accurately scribe and secure to walls, and/or floors.
- B. The installation shall be complete including all trim and hardware. Leave the casework clean and free from defects.

#### **3.2 FASTENINGS**

- A. Fastenings for securing casework to adjoining construction shall be as detailed on the drawings or approved shop drawings.
- B. See Section 05 50 00, METAL FABRICATIONS for reinforcement of walls and partitions for casework anchorage.

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**SECTION 12 35 70.21  
MEDICATION CABINET**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section covers Medication Cabinet consisting of a plastic for the storage of medicines and drugs.

**1.2 MANUFACTURER'S QUALIFICATIONS**

Medication cabinet shall be product of manufacturers regularly engaged in manufacturing cabinets of type specified. Basis-of-Design Product shall be as manufactured by Cygnus Inc., and as indicated on the Drawings.

**1.3 SUBMITTALS**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES, furnish the following:
- B. Shop Drawings: Medication cabinet, showing design, materials, construction and installation.
- C. Manufacturers' Certificates: Certificate signed by manufacturer that servicing of component parts can be made from the front of the cabinet.

**1.4 EQUIPMENT MANUAL**

The supplier shall furnish with each cabinet two copies of the manufacturers' equipment manual containing installation, operation and maintenance instructions, parts list showing part number and source of supply.

**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):
  - A167-99 (R2004).....Stainless and Heat-resisting Chromium-Nickel Steel Plate, Sheet and Strip
  - D4802-02.....Acrylic Plastic Sheet

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

Acrylic Plastic: ASTM D4802.

**2.2 FABRICATION**

- A. The medication cabinet shall be of the following sizes as indicated on the Drawings.

- B. General Requirements: The cabinet shall be recessed mounted and provided with shelves, doors, drawers, and storage compartment.
- c. Shelves: In the upper section of the cabinet, provide at least two removable adjustable shelves, as shown.

### **PART 3 - EXECUTION**

#### **3.1 FASTENINGS AND ANCHORAGE**

- A. Fastenings and anchorage for securing medication cabinet, except as otherwise specified, to adjoining construction shall be by toggle or expansion bolts, approximately 6 mm (1/4 inch) in diameter or other appropriate size and type of fastenings as required for each specific type of installation.
- B. Where type, size or spacing of fastening is not shown or specified, submit shop drawings for approval showing proposed fastenings and method of installation.
- C. Fastenings and anchorage for cabinets to metal stud partitions shall be as detailed on the drawings.

#### **3.2 CLOSURES**

- A. Close openings larger than 6 mm (1/4 inch) wide between cabinets and adjacent walls, and where shown, with either 18 gage flat steel closure strips, scribed to required contours or 20 gage machined formed fillers with returns and secured with sheet metal screws to tubular or channel members of units or with bolts where exposed on inside.

#### **3.3 INSPECTION**

- A. Upon completion of the installation, the manufacturer shall examine the anchorage, check the operation of the equipment and the hardware, and examine the finish for damage.
- B. Manufacturer shall report in writing that the installation is satisfactory and shall include information concerning minor adjustments and minor repairs which may be required for final acceptance by the COTR.

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**SECTION 12 36 00  
COUNTERTOPS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies solid-surfacing window stools, casework  
countertops, plastic laminate, quartz composite, and solid-surfacing  
countertops with integral backsplash.
- B. Integral accessories include:
  - 1. Sinks with traps and drains for solid-surfacing countertops, only.

**1.2 RELATED WORK**

- A. Color and patterns of plastic laminate: SECTION 09 06 00, SCHEDULE FOR  
FINISHES.
- B. DIVISION 22, PLUMBING.
- C. DIVISION 26, ELECTRICAL.
- D. Equipment Reference Manual for SECTION 12 36 00, COUNTERTOPS.

**1.3 SUBMITTALS**

- A. Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA,  
AND SAMPLES.
- B. Shop Drawings
  - 1. Show dimensions of section and method of assembly.
  - 2. Show details of construction at 1/2 scale.
- C. Samples:
  - 1. 150 mm (6 inch) square samples each top.
  - 2. Front edge, back splash, end splash and core with surface material  
and booking.
  - 3. For granite top selections, provide (3), 4" x 4" samples of each of  
the following granite types: Blue Pearl, Verde Peacock, or Uba Tuba.

**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. Plastic Laminate: NEMA LD 3.
  - 1. Concealed backing sheet Type BKL.
  - 2. Decorative surfaces:
    - a. Flat components: Type GP-HGL.
    - b. Post forming: Type PF-HGP.
- B. Solid Polymer Material(Solid-Surfacing 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
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.

## 2.2 SINKS

### A. Molded Resin:

1. Cast or molded in one piece with interior corners 25 mm (one inch) minimum radius.
2. Minimum thickness of sides and ends 13 mm (1/2 inch), bottom 16 mm (5/8 inch).
3. Molded resin outlet for drain and standpipe overflow.
4. Provide clamping collar permitting connection to 38 mm (1-1/2 inch) or 50 mm (2 inch) waste outlet and trap, making sealed but not permanent connection.

## 2.3 TRAPS AND FITTINGS

### A. Material as specified in DIVISION 22, PLUMBING.

### B. For Molded Resin Sinks:

1. Chemical resisting P-traps and fittings for chemical waste service.



2. Provide traps with cleanout plug easily removable without tools-

#### **2.4 COUNTERTOPS**

- A. Fabricate in largest sections practicable.
- B. Fabricate with joints flush on top surface.
- C. Fabricate countertops to overhang front of cabinets and end of assemblies 25 mm (one inch) except where against walls or cabinets.
- D. Provide 1 mm (0.039 inch) thick metal plate connectors or fastening devices (except epoxy resin tops).
- E. Join edges in a chemical resistant waterproof cement or epoxy cement, except weld metal tops.
- F. Fabricate with end splashes where against walls or cabinets.
- G. Splash Backs and End Splashes:
  - 1. Not less than 19 mm (3/4 inch) thick.
  - 2. Height 100 mm (4 inches) unless noted otherwise.
  - 3. Laboratories and pharmacy heights or where fixtures or outlets occur: Not less than 150 mm (6 inches) unless noted otherwise.
  - 4. Fabricate epoxy splash back in maximum lengths practical of the same material.
- H. Drill or cutout for sinks, and penetrations.
  - 1. Accurately cut for size of penetration.
  - 2. Cutout for VL 81 photographic enlarger cabinet.
    - a. Finish cutout to fit flush with vertical side of cabinet, allowing adjustable shelf to fit into cutout space of cabinet at counter top level. Finish cutout surface as an exposed edge.
    - b. Provide braces under enlarger space to support not less than 45 kg (100 pounds) centered on opening side along backsplash.
- I. Plastic Laminate Countertops:
  - 1. Fabricate plastic laminate on five-ply plywood or particleboard core 19 mm (3/4 inch) thick with plastic laminate backing sheet.
  - 2. Front edge over cabinets not less than 38 mm (1-1/2 inches) thick except where plastic "T" insert is used, not less than 19 mm (3/4 inch) thick.
  - 3. Exposed Surface and edges of decorative laminated plastic or laboratory chemical resistant surface.
    - a. Use chemical resistant surface on tops 6A, 6B, and 6C.
    - b. Use decorative surface tops when noted plastic laminate, for tops 10A, 10B and 10C.
- J. Methyl Methacrylic Polymer(Solid Surfacing)Tops and Window Stools:

1. Fabricate countertop of methyl methacrylic polymer cast sheet, 19 mm (3/4 inch) thick.
2. Fabricate back splash and end splash to height shown.
3. Fabricate skirt to depth shown.
4. Fabricate with marine edge where sinks occur.
5. Fabricate in one piece for full length from corner to corner up to 3600 mm (12 feet).
6. Join pieces with adhesive sealant.
7. Cut out countertop for lavatories, plumbing trim.
8. Provide concealed fasteners and epoxy cement for anchorage of sinks to countertop.

K. Quartz Composite Tops:

1. Quartz Composite: Comply with ASTM C 615.
2. Description: Uniform, homogeneous quartz.
3. Finish: Polished.
4. Fire test response characteristics:
  - a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E 84) or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - b. Flame Spread Index: 25 or less.
  - c. Smoke Developed Index: 450 or less.

## **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.

5. Install methyl methacrylic polymer sinks in manufacturer's 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.

### **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 17 00**  
**PRE-FABRICATED FIREPLACE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section covers the furnishing and installation of pre-fabricated fireplace fireboxes, complete with log set and ember bed.

**1.2 RELATED WORK**

Section 04 72 00, CAST STONE MASONRY, for stone surrounds at each fireplace.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Pre-fabricated fireplace firebox, showing design, construction and materials. Provide layout drawings with detailed erection drawings and specification.
- C. Manufacturer's Literature and Data: Pre-fabricated fireplace firebox.

**1.4 WARRANTY**

Warrant fireplace parts and operation subject to terms of "Warranty of Construction", FAR clause 52.246-21.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Basis-of-Design Product: Opti-Flame, by Dimplex, Built-in Purefire Firebox BF39, or COTR approved equal.
- B. Built-in manual switches - main on/off heater. Units should also be wired with separate wall switches to control flame operation.
- C. Volts: 120
- D. Watts: 1440
- E. BTU: 5000

**2.2 CABINET**

Flat Wall - White.

**2.3 ACCESSORIES**

- A. Glass door.
- B. White, wall mounted thermostat, field installed.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install fireboxes per manufacturer's written instructions.
- B. Clean area, and test new firebox for proper operation for a minimum of one hour, each unit.

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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/Service Elevators P-1 (right hand) and P-2 (left hand) shall be oil hydraulic direct plunger type with microprocessor based control, duplex selective collective automatic operation with power-operated two-speed side 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 two 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 (2010).....Safety Code for Elevators and Escalators
  - A17.2 (2010).....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.
- H. Elevator design is based on a Schindler 330A, Bore Hole Hydraulic Elevator; all dimensions and hoistway clearances are to be verified, and approved, by the elevator manufacturer, prior to submittal of shop drawings.

### 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	P-2
Overall Platform Size	6'0" x 9'6.5"
Rated Load - kg(lb)	5000lbs
Contract Speed - m/s(fpm)	100fpm
Total Travel - m/s(fpm)	11'0"

ELEVATOR SCHEDULE	
Number of Stops	(2) - 1 and 2
Number of Openings	2
Entrance Type & Size	Two speed side opening 48"w x 84"h
Plunger Size	(6" approximate) sized to maintain max. working pressure of 500psi

#### **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 conduits 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.

## **2.10 AUXILIARY POWER OPERATION**

- A. The control system for Elevators P-1 and P-2 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:
  - 1. Selector switch, Automatic position:
    - a. One elevator at a time shall be automatically selected and returned to the main floor, at normal speed, cycle its car and hoistway doors and shut down, with "Door Open" button remaining operable.

- b. As each elevator reaches the designated floor and shuts down, another elevator shall start and return to the designated floor.
  - c. Elevators that have been manually removed from automatic service and are on independent service, fire service or medical emergency shall receive an automatic return signal. Elevators on inspection service or out of service shall not receive a signal.
  - d. When an elevator is given a signal to return and it is unable to start its movement to the designated floor within 30 seconds it shall be by-passed. When an elevator is by-passed, another elevator shall start and return.
  - e. This process shall continue until all elevators have returned to the designated floor and shut down.
  - f. Any elevator or elevators by-passed on initial return signal shall be signaled again.
  - g. When all elevators have returned to designated floor, one elevator shall be designated for automatic operation.
2. Selector switch, Manual operation:
- a. Selector switch shall be mechanically and electrically interlocked to prevent the selection of more than one elevator from operating on auxiliary power.
  - b. The selector switch shall have positions marked with the number of each elevator controlled. It shall also have a position marked "Automatic". When the selector switch is set to the automatic position, the medical emergency service car, shall operate on auxiliary power operation, or if none, the last car arriving at the designated floor and be capable of functioning under all design features.
  - c. Change in selection of elevators shall be by means of the selection switch and shall occur only when the previous selected elevator is stopped at the designated floor.
  - d. The selector switch shall be locked out of operation when the system is in the normal mode of operation.
  - e. Locate the selector switch above the hall push button station at the designated level in a NEMA 1B flush type enclosure furnished with a brushed finish stainless steel hinged door and frame. The door shall contain a tumbler type lock furnished with four keys. The enclosure faceplate shall be identified "Auxiliary Power

Control" with 13 mm (1/2 in.) engraved letters filled with black paint.

3. The inside of the selector panel shall be brushed finish stainless steel with each device identified with 3 mm (1/8 in.) engraving filled with black paint. The panel shall contain:
  - a. Selector switches for selecting the elevators shall be toggle type or rotary key switch.
  - b. Pilot lights to indicate normal mode of operation, auxiliary power service available, and which elevator or elevators in each group is connected to auxiliary service.
  - c. A lamp test circuit consisting of a momentary contact push button to test all pilot lights in the circuit.
  - d. Provide a permanently mounted, easy to read, instruction plate which shall include operating instructions for auxiliary power service and instructions for lamp test circuits.
- 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.

#### **2.11 DUPLEX SELECTIVE COLLECTIVE AUTOMATIC OPERATION**

- A. Provide duplex selective collective automatic operation, for passenger/service elevators P-1 and P-2.
- B. Operate elevators from push buttons inside the cars and located at each floor between elevators. When cars are available, park one car at main floor (home car) and the other car at last call (free car). Respond to car calls and hall calls above main floor using the "free" car. Once a car has started, respond to registered calls in the direction of travel and in the order the floors are reached. Do not reverse the car direction until all car calls have been answered, or until all hall calls ahead of the car and corresponding to the direction of car travel have been answered.

Slow and stop elevators automatically at floors corresponding to registered calls in the order in which they are approached in each direction of travel. As slowdown is initiated, automatically cancel hall call and car call. Hold car at arrival floor an adjustable time interval to allow passenger transfer.

When the "free" car is clearing calls, the "home" car to shall respond to the following:

1. Calls registered on "home" car push buttons.
  2. Up hall calls registered below "free" car.
  3. Up or down calls registered above "free" car while "free" car is traveling down.
  4. Hall calls when "free" car is delayed in its normal operation for a predetermined period.
- C. When both cars are clearing calls, stop only one car in response to any registered hall call. Return the first car to clear its calls to the main floor. Should last service required bring both cars to the main floor, the first arriving car becomes the "free" car. Illuminate floor push button to indicate call registration. Extinguish light when call is answered.
- D. If a landing call button is operated 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 reopened by means of "DOOR OPEN" button or infrared curtain unit.
- E. When an elevator is delayed for a predetermined time interval or shuts down after it receives a start signal, the system shall automatically permit the remaining car in the group to respond to hall calls and to be dispatched in normal manner. When cause of delay is corrected, car shall automatically resume normal operation unless it has been manually removed from the system.
- F. Auxiliary Landing Call Operation: In the event of landing call button circuit failure, elevators are to service each floor in both directions in a predetermined pattern without registration of a call within elevators. Provide illuminated signal in each controller to indicate that emergency dispatch operation is in effect. Restoration of the landing call button system shall cause normal operation to resume.
- G. Car lights and fan in the elevator shall not shut off when elevator is idle. Arrange circuits so that power to 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.
1. Main Floor - 1<sup>st</sup>
  2. Alternate Floor - 2<sup>nd</sup>
- 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.

**2.13 MEDICAL EMERGENCY SERVICE - not required**

**2.14 SEISMIC REQUIREMENTS - not required**

**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.

## **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 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. 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.
  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, 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.

#### **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 22.5 kg/m (15 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. Independent Service switch, see Section 2.30 for detailed description.
  8. 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.
9. 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.
  10. 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.
  11. 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.
  12. 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.
  13. 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".
5. Two position emergency stop switch, when operated, shall interrupt power supply and stop the elevator independently of regular operating devices. Emergency stop switch shall be marked "PULL TO STOP" and "PUSH TO RUN".

## **2.29 AUXILIARY CAR OPERATING PANEL**

- A. Provide an auxiliary car operating panel in the side wall of the elevator between the handrails immediately adjacent to the front entrance column strike jamb. The auxiliary car operating panel shall contain only those controls essential to passenger (public) operation. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with stainless steel tamperproof screws.
  1. Mount door "OPEN" and door "CLOSE" buttons closest the door jamb and mount the red alarm button no lower than 875 mm (35 in.) above the finished floor. The Door Open button shall be located closest to the door jamb as required by ADA.
  2. Complete set of round car call push buttons, minimum diameter 25 mm (1 in.), and LED white light illuminated, corresponding to the floors served. Car call button shall be legibly and indelibly identified by a floor number and/or letter not less than 12 mm (1/2 in.) high in the face of the call button corresponding to the numbers of the main car operating buttons. Install buttons in a vertical stack on front mounted panel up to six floors and horizontally for side mounted panel.
  3. Cross-connect all buttons in the auxiliary car operating panels to their corresponding buttons in the main car operating panel. Registration of a car call shall cause the corresponding button to illuminate in the main and auxiliary car operating panel.
  4. 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. Install emergency telephone system in the auxiliary car operating panel.

5. 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.

#### **2.30 INDEPENDENT SERVICE**

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**

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**

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. "Please do not block doors."
3. 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 side slide doors, mount the access key switch 1830 mm (6 ft) above the corridor floor in the wall next to the strike 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 nickel silver 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 hoistway 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.
- G. Provide hoistway entrance with flush two speed side slide hoistway doors for Elevators P-1 and P-2. 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 fast speed panel of two-speed 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 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. 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. 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.

- K. 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 wall. Curve ends of handrails to walls. Conceal all handrail fastenings. Handrails shall be removable from inside the car enclosure.
- L. Provide car entrance with two-speed side opening horizontal sliding car doors, of same type as hoistway doors for Elevators P-1 and P-2. 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 gibson 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.
- M. Provide each service elevator one set of protection pads of sufficient length to completely cover two sides, rear walls and front return of cab interior. Pads shall consist of a minimum of 6 mm (1/4 in.) thick glass fiber insulation securely sewn between flame resistant vinyl coated coverings. Insulation shall conform to ASTM E 84, UL 723, CAN/ULCS102.2, or ASTM C612. Color of the covering shall be approved by the Resident Engineer. Provide stainless steel pad buttons or hooks,

spaced at intervals of not more than 150 mm (18 in.) to adequately support pads.

#### **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 or spring loaded sill mounted 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**

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 door frames, 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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**SECTION 14 92 00  
PNEUMATIC TUBE SYSTEM**

**PART 1 - GENERAL:**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of the contract including general and supplementary conditions of Division 1 of the Specification sections apply to the work of this section.

**1.2 DESCRIPTION OF WORK:**

- A. Furnish all engineering, materials and labor for a 2 station expansion of the computer controlled pneumatic tube distribution system, hereinafter referred to as the "System". The System shall be manufactured and installed by TransLogic Corporation hereinafter referred to as the "Contractor".
- B. All work shall be completed in a workmanlike manner, complete in all respects, including all items specified herein and as may be necessary for the satisfactory installation and operation of the specified system.
- C. The types and locations of the stations in this specification shall be as indicated on the drawings and shall be in strict accordance with the standards established by the Contractor.
- D. The Contractor shall work with the General Contractor and all trades to ensure coordination for System right-of-way.

**1.3 QUALITY ASSURANCE**

- A. The Contractor shall regularly and presently manufacture, install and warrant the computer controlled material distribution equipment as specified herein as one of their principle products. The equipment furnished shall be the product of the Contractor and shall be installed by skilled mechanics under direct employment and supervision of the Contractor. No third party substitutions shall be involved in design, layout, installation, warranty efforts or service offerings. The Contractor shall have a quality assurance program in place, demonstrable to the Owner.

- B. The Contractor shall be totally responsible for the manufacture, installation and guarantee of the specified System.
- C. The Contractor shall maintain a training facility that shall include the specified equipment installed and operational for comprehensive hands-on maintenance instruction of Owner maintenance personnel. The training facility shall be separate from the Contractor's manufacturing or development areas to prevent interruptions during the training process.
- D. The Contractor shall maintain a 24 hour, 7 day per week toll-free phone number for contacting maintenance personnel who are factory trained in the specified System. Response shall be 3 hours or less.
- E. All electrical equipment shall be listed with Underwriter's Laboratory (UL) and all field wiring shall be in conformance with NEC requirements and local codes. UL listing shall be for all assemblies and components of assemblies. UL listing must be current prior to bid.

**1.4 WORK INCLUDED IN THIS SECTION:**

- A. The Contractor shall be responsible for general contracting activities associated with the installation of the System as specified in a separate section.

**1.5 WORK NOT INCLUDED IN THIS SECTION:**

- A. Items described herein relate to the installation of the System, but are excluded from this section of the specification. The Contractor shall provide information as required to perform the work.
- B. General items.
  - 1. Supply and installation of architectural enclosures for equipment as specified on the contract drawings or shop drawings.
  - 2. Equipment fur-in to match existing surroundings.
  - 3. A clear and unobstructed right-of-way space for System equipment.
  - 4. Removal, repair or replacement of existing ceilings or walls to match existing surroundings.
  - 5. Removal, relocation and/or replacement of other mechanical equipment, fixtures, conduit, pipe, etc.

6. Supply and installation of access panels where specified on contract drawings and/or shop drawing submittals.
7. Painting of exposed tube and unfinished exposed surfaces where required.
8. Adequate storage space for materials on the job site during construction.
9. Elevator, hoisting or crane services for equipment and personnel during construction.
10. Dust protection if required.
11. Sealing of sprayed fire-retarding insulation in close proximity to any System equipment.
12. Cleaning of all plaster, mortar, paint, and other debris in or on the System equipment resulting from other trades.
13. Repairing, replacing or repainting of equipment damaged by other trades.

C. Electrical items:

1. A 115 VAC single phase, 50/60 Hz power supply wired to terminals in a factory installed duplex receptacle within each station, transfer unit and blower package.

D. Data Connections:

1. An active Ethernet jack located inside the station housing for each station on the same IT network as the system control center.
2. An active Ethernet jack located within 6 feet of each system blower and transfer unit on the same IT network as the system control center.

E. Hazardous Materials:

1. Identification of all areas with unabated asbestos.
2. All inspections, testing, monitoring, abatement and containment for any hazardous material including asbestos, which is encountered anytime in the duration of the project.

**1.6 SUBMITTALS:**

- A. Shop drawings which show tube routings on architectural floor plans, tubing riser diagram, electrical riser diagram, right-of-way, methods of suspending and anchoring tubing, station details, equipment locations and detailed dimensions of all major components. Tube routings shall be shown on owner-supplied architectural floor plan backgrounds in AutoCAD release 14.0 or higher.
- B. Contractor's marked literature showing illustrations, data and description of system to be furnished.
- C. Single User Software License form with submittal for signing by the Owner and Contractor.

**1.7 WARRANTY:**

- A. The Contractor shall guarantee all components to be free from defects in material and workmanship, under normal use, for a period of 12 months.
- B. Defective material shall be repaired or replaced at the discretion of the Contractor, free of charge.
- C. Specifically excluded from this warranty are failures resulting from normal wear, improper operation, improper maintenance or lack of prescribed owner preventive maintenance of the system.
- D. Signed acceptance or use of the System by the Owner shall commence the warranty period.
- E. The Contractor's liability shall not be enforceable until receipt of full payment for the System.

**2. PRODUCTS**

**2.1 EQUIPMENT:**

- A. Line material:

1. Tubing shall be 4" outside diameter, 16 gauge, cold rolled, electric welded steel, flash removed, degreased and hot dip galvanized.
2. Bends shall be formed of same material on a center line radius of not less than 48 inches. The cross-section shall be free from wrinkles and distortions. No expanded bends shall be allowed in the System.
3. All cut ends shall be square, deburred and mandreled round.
4. Solid steel slip sleeves or split steel gasketed bolted sleeves shall be used for tubing joints. Split sleeves shall be used at all connections of serviceable equipment. All sleeves shall be of the same gage as the tubing.
5. Slip joints shall be sealed with a suitable airtight compound.
6. Tubing shall be supported with suitable hangers and supports as follows:
  - a. Minimum every ten (10) feet of straight tubing,
  - b. At every floor of vertical runs,
  - c. At each end of each bend, and
  - d. At equipment connections
7. Hangers shall be pre-threaded, zinc plated rod attached to the building structure. Tear-drop hangers fastened to the rod shall support the tubing.

B. Transfer Units:

1. Transfer units enable a transmission tube connection from one tube to any one of several tubes, providing the tubing network for routing carriers between stations.
2. Transfer units shall be installed with split sleeves and sway braced against motion.
3. Transfer units shall be located to allow for complete and clear access to service mechanical and electrical components.
4. The offset through the transfer unit shall be gradual using a curved tube section.
5. All transfer units component position sensing and carrier sensing shall be by non-contact sensors.

6. All visible metal surfaces shall be galvanized steel, aluminum, or finished with a factory painted electrostatically applied, baked-on, powder coat finish.
7. Transfer units shall be provided as required in 1 to 2 ports, 1 to 4 ports and 1 to 6 ports.

C. Stations:

1. Stations shall consist of dispatch equipment, receive equipment and electrical controls enclosed in a sheet metal housing.
2. Stations shall be up send, down receive.
3. All mechanical and electrical components shall be front accessible and removable for repair or replacement.
4. Electronic control units shall be solid state plug-in type for fast replacement and shall be interchangeable with units in other stations.
5. All component position sensing and carrier sensing shall be by non-contact sensors.
6. All visible metal surfaces shall be factory painted with an electrostatically applied, baked-on, powder coat epoxy. Bright metal finish parts shall be stainless steel, brushed aluminum or chrome plated.
7. The dispatcher shall hold one carrier at a time.
8. The receiver shall be independent of the dispatcher.
9. The dispatcher shall enable a carrier to be staged for dispatch while a carrier is incoming to a station.
10. When station's receiver becomes full, that station's receive and dispatch functions shall be disabled. A message on the station display and at the system control center shall indicate the full condition. The condition shall automatically reset upon carrier removal from receiver.
11. Stations shall provide air-cushioned carrier arrival at the receive slidegate.
12. Stations shall be capable of dispatching a seven pound payload. Stations at each location shall include a full capacity dispatcher to handle dispatch payloads of up to twelve pounds.
13. Multiple address capability:

- a. Multiple addresses enable a station to be shared by several departments. Each station shall have the capability for up to six discrete addresses.
  - b. Each address shall correspond to a remote personal indicator (RPI). An RPI is a recessed, wall mounted visual and audible signal device with reset switch, located remote from the station.
  - c. Carriers received via the automatic carrier redistribution feature shall not activate RPI's.
14. Each station shall be equipped with one modular operator control panel per dispatcher.
- a. The I.Q. operator control panel shall include:
    - i. A membrane keypad for destination and special function selection.
    - ii. A liquid crystal display panel (LCD) with up to 8 lines of 40 characters each for message display. The LCD panel shall display:
      - 1. The last destination selected.
      - 2. Help menu selections.
      - 3. A directory of stations.
      - 4. Special functions.
      - 5. Operator feedback information.
    - iii. "Up" and "Down" arrow keys for scrolling through the LCD displays.
    - iv. A "Send/Enter" key to activate the dispatch after destination selection or to enter data for special functions.
    - v. A "Cancel/Clear" key to allow for transaction cancellation or clearing of the display during special function activation.
    - vi. An "Empty Send" key for surplus carrier redistribution.
    - vii. A "Call Carrier" key to call an empty carrier from the carrier storage system (if equipped)
    - viii. A "Track Carrier" key to track a transaction.
    - ix. Up to six LED's for RPI visual indication.



- x. Twelve programmable keys all of which can be used for one button addressing of high traffic stations or up to six of which can be used for resetting RPI's.
  - 1. Keys shall be individually programmable per station.
  - 2. Programming of keys can be done locally at the station or set at the system control center and download to the station.
    - a. In addition to the destination, keys may also be programmed with a transaction attribute of "STAT", "SECURE", "PIN SECURE" or "SLOW" (if equipped with variable speed blowers.
  - 3. The RPI audible signal can be reset at the RPI. The station and RPI LED's are reset at the station.
- xi. A "Carrier Returned" message and indicator to signal that a transaction was unable to be completed and the carrier was returned to its origin station.
- xii. A "Menu" key for selecting special functions.
  - 1. Stat Transaction
  - 2. Secure Transaction
  - 3. PIN Secure Transaction
  - 4. Assign Carriers Present
  - 5. Traffic Forwarding
  - 6. Emergency Shutdown
  - 7. Incoming Carrier Query
  - 8. Station On/Off
  - 9. Carrier Inventory Adjustment
  - 10. Station Diagnostics
  - 11. Audible Carrier Arrival
  - 12. Audible Surplus Carriers
  - 13. Audible Full Station
- xiii. A "Station Directory" key for displaying a directory of station addresses.
- xiv. Instructions for operating the station and special functions.
- xv. Discrete rejection messages to indicate:

1. Dispatching station off
  2. Dispatching station not in service
  3. Selection full - try later
  4. Selection does not exist
  5. Selection scheduled off
  6. Selection signed off
  7. Selection not in service
  8. Selection is secured
  9. Selection not permitted
- xvi. LCD message capability for the following conditions:
1. A carrier is incoming to the station.
  2. The station carrier count exceeds its assigned number, return surplus carriers.
  3. The station is full, remove carriers from receiver.
  4. The station is not receiving carriers; traffic is forwarded to another station.
  5. Stations with I.Q. station control panels shall be located at each station.

D. Recessed single dispatcher stations:

1. Recessed single dispatcher stations shall include one dispatch chamber and an integral receive bin. The receive bin shall provide open storage nominally for seven carriers.
2. The station shall be designed to be wall recessed enabling all non-operator accessible equipment to be concealed behind walls. A trim frame shall be provided to conceal the joint between the wall and the station housing.
3. To minimize damage, stations shall be installed in two phases; a housing in the initial stages of construction, and a mechanical/electrical finish kit after construction work in the area is substantially complete.
4. Recessed stations shall be located as shown on contract drawings.

E. Carriers and liners:

1. Standard carriers:
  - a. Provide four (4) standard carriers per station for a total of \_\_\_\_ as follows.

- i. Clear molded plastic.
- ii. Full access side opening and self-latching upon closure.
- iii. Bi-directional.
- iv. Replaceable wear bands and latches.
- v. Capable of carrying: specimens, medications, x-ray film, 1,000 ml IV bags with up to 100 ml's additives.
- vi. Clear inside dimensions: 3-1/16" diameter by 15-1/4" length.

### **3. EXECUTION:**

#### **3.1 INSTALLATION:**

- A. The System and components shall be assembled and installed in strict accordance with contract documents, applicable codes and regulations, approved shop drawings, and Contractor's recommendations.
- B. The System and components shall be anchored and fastened to building construction as required for a stable, secure installation. All exposed parts of the System and finish components shall be closely fit and joined to provide a neat uniform appearance.

#### **3.2 SYSTEM TESTING AND ACCEPTANCE:**

- A. Prior to a formal System performance test, the Contractor shall perform preliminary tests, verifying all components are in fully operational condition for carrier dispatch and receive between all possible station combinations.
- B. The Contractor shall provide written notification to the Architect/Engineer thirty (30) days in advance of the scheduled System performance test. The Contractor shall provide all personnel, equipment and instruments required for such examination.
- C. In the presence of the Architect and Owner, the Contractor shall perform all operational tests, inspecting System components and verifying that the equipment is installed and operating in proper condition, according to the intent of the contract.
- D. The Owner's representative shall sign a written statement indicating that the System has been turned over and accepted by the Owner.

#### **3.3 INSTRUCTIONS:**

- A. Operator training
  - 1. The Contractor shall train the Owner's training staff on-site in the use and operation of the System. Training shall be provided for one person per station with a minimum of ten.
- B. The Contractor shall provide as-built shop drawings on AutoCAD 1212 for instruction and future reference by the Owner.

#### **3.4 EXCEPTIONS:**

- A. Exceptions to the specification shall be clearly identified in a separate proposal section entitled, "Exceptions to Specifications".

#### **3.5 ALTERNATIVES:**

- A. Base bid to be quoted. Alternatives to be offered in a separate proposal section entitled, "Alternatives".