



VOLUME 1 of 3 – ARCHITECTURAL AND STRUCTURAL SPECIFICATIONS

VA SPECIFICATIONS

FOR

**NEW SUBSTANCE ABUSE BUILDING ADDITION TO BUILDING #170**

FOR

CENTRAL ARKANSAS VETERANS HEALTHCARE SYSTEM

AT

**NORTH LITTLE ROCK, ARKANSAS**

**CENTRAL ARKANSAS VETERANS HEALTHCARE SYSTEM**  
**CONTRACT #VA256-P-1272**  
**NEW SUBSTANCE ABUSE BUILDING ADDITION TO BUILDING #170**

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**SECTION 00 05 01** **11/11(rev.13)**  
**SPECIAL REQUIREMENTS FOR WORK WITHIN A VA HOSPITAL**

1. GENERAL:

- A. This section is to bring to the attention of the contractor, Special Requirements of our hospital. Our primary goal is to provide safe, accurate, comfortable treatment and diagnostic work. The construction project is secondary. The prints may show phasing but cannot convey every consideration that must be given to implement the plan. Close coordination and advance notifications must be provided. The VA cannot tolerate the method of construction as would be done in an empty building for example. Therefore, the contractor shall plan for cleanliness, dust proofing, quietness, etc., as needed.

The following are considerations and requirements needed in order to work at the hospital.

- B. Requirements:

**INFECTION CONTROL PROCEDURES  
TO BE APPLIED TO ALL CONSTRUCTION PROJECTS**

The overriding principal is to work within an area that is under negative pressure and contain all dust within the construction area.

In order to accomplish the above, the CUBE method will be used. This method demands that a CUBE consisting of the floor, walls both above and below suspended ceilings and the deck above be established and maintained while construction is being performed. Walls may have to be built by the contractor if the existing walls cannot be utilized. The CUBE will be kept under negative pressure. In addition to containing dust within the work area, dust must be kept from exiting the work area via footsteps and cart wheels.

The project will have an ICRA (Infection Control Risk Assessment) completed prior to any construction or phase of construction. This document will be posted and maintained at the construction site and serve as reminder of the precautions to be followed. The ICRA will address the following:

**ICRA**

- To be posted before any work is done and reviewed at each phase for any adjustment needed.
- To be initiated by IC (Infection Control department) or Engineering and signed off by both parties.
- ICRA forms will be kept by Safety and IC.

**Infection Control briefing**

- An overview of infection control will be given at the preconstruction conference.
- Superintendant will be required to attend the preconstruction conference.

**Barrier plan**

- Contractor will sketch out the placements of his barrier(s) and get approval by IC via the COTR.
- Barrier will be inspected by IC before each phase is started.

- Hard wall (drywall and metal studs) barriers will be used for work lasting longer than 24 hours. Tape and floating will not be needed. Joints will be covered with blue painters tape including attachment at walls, floors and ceilings.
- Plastic (fire-resistive ) can be used for work lasting 24 hours or less on barriers below ceilings. Plastic may be used for periods exceeding 24 hours above ceilings.
- The contractor may use the VA's Curtain-Wall system utilizing his own plastic.
- Barrier must also serve as physical barrier for when the area is not occupied by contractors. Entry will be via an actual door and frame and will be locked when not occupied.

#### Negative Air

- Existing ceilings may be used as part of the CUBE barrier.
- Minus .03 inches of water pressure must be maintained. The contractor is responsible for providing negative air unit(s) as needed to maintain .03 inches of pressure. Contractor must install a manometer with a scale of 0-1/2 inch water for each pressure area.
- Discharge into a corridor via a grill. The VA must prove that air discharged is clean (HEPA) via a particle meter before the unit is turned on and any work started.

#### Mats

- Carpet shall not be used. Contractor must clean his wheels and feet in the anteroom so that no dust is tracked down the hall.
- Sticky mats will be used in class 3 and 4 construction and will be changed every 4 hours.

#### Anteroom

- Serves as an air lock and a place to remove dust from people, carts, feet, etc.
- Can be built inside the construction area or if built in the corridor, 5 feet clearance must be maintained.
- Must be hard walls.
- Air flow will be from the outside common space into the anteroom and then into the construction area.

#### Gross demolition

- Tyvek coveralls and disposable shoe covers must be worn during gross demolition phase which is defined as wall, ceiling and flooring removal.
- Disposable items are to be used one time.
- Must be removed in the ante room before leaving the work area.

#### Existing HVAC Grills

- Must seal all grills – supply, return, and exhaust.
- Seal by substantial method to prevent barrier from coming loose. Use blue painter tape only and do not use duct tape anywhere.

#### Above Ceiling Inspections – as part of work planning

- Allowed to remove one tile per 50 square feet for inspection with no IC control.
- No work will be allowed without IC control with the exception of allowing cable pulling which may be done with the CUBE method.

#### Fire or Smoke barriers

- Temporary barriers must be built to give the same rating through an alternate path when existing barriers must be compromised.
- Permanent new rated walls and ceilings (as needed) will be built before existing rated barriers are compromised.

#### General

- Clean the work area daily to control the amount of accumulated dust from collecting within the work area.
- Ceiling T-grids must be vacuumed before tile is placed.
- Utility runs that don't necessarily have work contained to a room will still have to confirm to the CUBE method. A plastic barrier will have to be placed over the location of a utility run and secured to the remaining ceiling in conjunction with existing walls and / or barrier walls.

#### 2. Telephone and Computer Wiring:

All telephone and computer jacks shall be removed by the VA as needed. At the pre-construction walkthrough, the contractor shall discuss timeframes for removal with the COTR (Contracting Officer's Technical Representative) who will contact the VA's telecommunications group for actual removal. **THE CONTRACTOR SHALL NOT ATTEMPT ANY REMOVAL INCLUDING THE UNPLUGGING OF PHONES AND COMPUTERS.**

3. The Fire Alarm devices – smoke detectors, heat detectors and pull stations, are all addressed devices. Do not remove any of these devices. If they must be removed, please contact the COTR.
4. Penetrations through floors and rated walls must be fire-stopped with materials made from the specific application at hand. Sealing must be done at the time the penetration is made and not done at the end of the job.
5. No temporary or permanent wireless access point or WIFI will be set up inside or outside any VA Building.

#### C. Other Areas of Concern:

1. When construction is near sensitive areas such as surgery, noisy operations shall be discontinued until a more appropriate time, which may be after normal working hours or on weekends. If this has been determined, it shall be accomplished at no additional cost to the VA.
2. The contractor shall notify the COTR in advance of operations that would cause disruption to the operation of the medical center. Examples of these disruptions are: utility shutdown, noise, vibration, etc. The contractor shall adjust his schedule to accommodate patient care activities.
3. Utilities shall not be disconnected without coordination with the COTR. Contractors have often cut power to "their" area and ended up cutting off power to areas outside the construction site.
4. Contractor shall not attempt to work an electric circuit hot. If necessary, a temporary electric feed will be run.
5. Odors may cause problems such as painting with oil-based paint on a patient ward. Reasonable action such as putting an exhaust fan in a window or hanging plastic to isolate a painted area shall be needed.
6. The contractor shall take all necessary precautions to ensure compliance with the Life Safety Code (2009) and be mindful of the seriousness of how this affects the

invalid. The contractor shall not block corridors, exits or access to exits at any time.

7. ID badges shall be worn by all workers at all times.
8. The construction area shall be secure at the end of the day. The contractor shall have a means of preventing patients, employees and other unauthorized personnel from entering the work site.
9. New fire/smoke barriers must be constructed before old barriers are demolished so that barrier integrity is maintained.
10. The VA must insure that no asbestos containing products are used in construction or equipment installation. The contractor shall obtain MSDS sheets or product literature stating "CONTAINS NO ASBESTOS" for the following classifications of products that have had a history of containing asbestos products. This list does not cover all suspect items. These MSDS sheets will be bound and submitted as proof that the building materials do not contain asbestos.

- a. Surfacing Materials: Sprayed or toweled-on
- b. Thermal insulating products: Batts, blocks, pipe covering, fire doors.
- c. Textiles: Gaskets, cloth, blankets, felts, sheets, cords/rope/yard, tubing, tape/strip, wiring
- d. Cementitious: Concrete-like materials, corrugated, flat, flexible perforated laminated, roof tiles, clapboard, shingles-roofing/siding, pipe
- e. Paper Products: Corrugated high temperature or moderate temperature, indented, millboard
- f. Roofing Felts: smooth surface, mineral surface, shingles, pipeline
- g. Asbestos containing compounds: caulking, caulking putties, glues, mastics, adhesive (cold applied), joint compound, roofing asphalt, mastics, asphalt tile cement, roof putty, plaster/stucco, spackles, sealants fire/water, cements such as insulation cement, finishing cement, magnesia cements
- h. Asbestos ebony products: as used in electrical boxes
- i. Flooring tile and sheets goods: vinyl/asbestos tile, asphalt/asbestos tile, sheet goods/resilient
- j. Wall covering: Vinyl wallpaper
- k. Paints and coatings: Roof coating, air tight

D. The following items are clarifications that have caused confusion and problems in the past:

1. When painting, the entire doorframe shall be painted (excluding UL or other Fire Rating information). Walls shall be painted to a natural break of change in direction. Door silencers shall not be painted.
2. Contractors shall mark their dumpsters so VA employees will not assume it is a VA dumpster.
3. When excavating, the contractor shall be responsible for locating items within ten (10) feet as scaled from a plan.
4. Operational and Maintenance Manuals (4 sets) shall be required for completion of the job.
5. Workers parking where not permitted or without proper dash signage displayed, shall be ticketed.
6. The VA shall not loan tools or materials to the contractor. It is your responsibility to furnish all labor, materials and equipment necessary for completion of the job.

7. The job superintendent or designee shall be on site at all times when work is being performed.
8. The contractor shall not disturb the floors due to asbestos, other than how shown on the plans.
9. Where the contractor disturbs lawn areas, he shall aerate compacted areas and sod with common Bermuda.
10. When ceilings are replaced or altered in height, sprinkler heads shall be removed to allow the tiles to be installed. The heads shall be adjusted in height, if necessary, and reinstalled.
11. The VA policy is that there is no smoking in buildings or on rooftops. Smoking is allowed in designated areas only.

- - - END - - -

| <b>Infection Control Construction Worksheet – Class III/IV</b> |    |   |     |                     |                              |
|--|----|---|-----|---------------------|------------------------------|
| Location of Construction:                                      |    |   |     | Project Start Date: |                              |
| Construction Foreman:  |    |   |     | Estimated Duration: |                              |
| Contractor Performing Work:                                    |    |   |     | Completion Date:    |                              |
| Supervisor:  |    |   |     | Telephone:          |                              |
| YES  | NO | CONSTRUCTION ACTIVITY   | YES | NO                  | INFECTION CONTROL RISK GROUP |
|  |    | TYPE A: Inspection, non-invasive activity   |     |                     | GROUP 1: Low Risk            |
|  |    | TYPE B: Small scale, short duration activities which create minimal dust.   |     |                     | GROUP 2: Medium Risk         |
|  |    | TYPE C: Work that generates moderate to high levels of dust, requires demolition or removal of any fixed building components or assemblies; greater than 1 work shift for completion. |     |                     | GROUP 3: Medium/High Risk    |
|  |    | TYPE D: Major demolition and construction projects; requires consecutive work shifts.   |     |                     | GROUP 4: Highest Risk        |

SPECIFIC REQUIREMENTS

**ICRA:**

1. To be posted before any work is done and reviewed at each phase for any adjustment needed.
2. To be initialed by IC (Infection Control Department) or Engineering and signed off by both parties
3. ICRA forms will be kept by Safety and Infection Control.

**INFECTION CONTROL BRIEFING:**

1. An overview of infection control will be given at the preconstruction conference.
2. Superintendent will be required to attend the preconstruction conference.

**BARRIER PLAN:**

1. Contractor will sketch out the placements of his barrier(s) and get approval by IC via the COTR (Contracting Officer's Technical Representative).
2. Barrier will be inspected by IC before each phase is started.
3. Hard wall (drywall and metal studs) barriers will be used for work lasting longer than 24 hours. Tape and floating will not be needed. Joints will be covered with blue painters tape including attachment at walls, floors and ceilings.
4. Plastic (fire-resistive) can be used for work lasting 24 hours or less on barriers below ceilings. Plastic may be used for periods exceeding 24 hours above ceilings.
5. The contractor may use the VA's Curtain-Wall system utilizing his own plastic.
6. Barrier must also serve as physical barrier for when the area is not occupied by contractors. Entry will be via an actual door and frame and will be locked when not occupied.

**NEGATIVE AIR:**

1. Existing ceilings may be used as part of the CUBE barrier.
2. Minus .03 inches of water pressure must be maintained. The contractor is responsible for providing negative air unit(s) as needed to maintain .03 inches of pressure. Contractor must install a manometer with a scale of 0-1/2 inch water for each pressure area.
3. Discharge into a corridor via a grill. The VA must prove that air discharged is clean (HEPA) via a particle meter before the unit is turned on and any work started.

**MATS:**

1. Carpet shall not be used. Contractor must clean his wheels and feet in the anteroom so that no dust is tracked down the hall.
1. Sticky mats will be used in Class 3 and 4 construction and will be changed every 4 hours.

**ANTEROOM:**

1. Serves as an air lock and a place to remove dust from people, carts, feet, etc.
2. Can be built inside the construction area or if built in the corridor, 5 feet clearance must be maintained.
3. Must be hard walls.
4. Air flow will be from the outside common space into the anteroom and then into the construction area.

**GROSS DEMOLITION:**

1. Tyvek coveralls and disposable shoe covers must be worn during gross demolition phase which is defined as wall, ceiling and flooring removal.
2. Disposable items are to be used one time.
3. Must be removed in the ante room before leaving the work area.

**EXISTING HVAC GRILLS:**

1. Must seal all grills – supply, return and exhaust.
2. Seal by substantial method to prevent barrier from coming loose. Use blue painter tape only and do not use duct tape anywhere.

**ABOVE CEILING INSPECTIONS** – as part of work planning:

1. Allowed to remove one tile per 50 square feet for inspection with no IC control.
2. No work will be allowed without IC control with the exception of allowing cable pulling which may be done with the CUBE method.

**FIRE OR SMOKE BARRIERS:**

1. Temporary barriers must be built to give the same rating through an alternate path when existing barriers must be compromised.
2. Permanent new rated walls and ceilings (as needed) will be built before existing rated barriers are compromised.

**GENERAL:**

1. Clean the work area daily to control the amount of accumulated dust from collecting within the work area.
2. Ceiling T-grids must be vacuumed before tile is placed.
3. Utility runs that don't necessarily have work contained to a room will still have to conform to the CUBE method. A plastic barrier will have to be placed over the location of a utility run and secured to the remaining ceiling in conjunction with existing walls and/or barrier walls.

**Matrix - Class of Precautions: Construction Project by Patient Risk**

| Patient Risk Group            | Construction Project Type |        |        |           |
|-------------------------------|---------------------------|--------|--------|-----------|
|                               | TYPE A                    | TYPE B | TYPE C | TYPE D    |
| <b>LOW</b> Risk Group         | I                         | II     | II     | III/IV    |
| <b>MEDIUM</b> Risk Group      | I                         | II     | III    | IV        |
| <b>MEDIUM/HIGH</b> Risk Group | I                         | II     | III/IV | IV        |
| <b>HIGHEST</b> Risk Group     | II                        | III/IV | III/IV | <u>IV</u> |

**Note** Infection Control approval will be required when the Construction Activity and Risk Level indicate that **Class III** or **Class IV** control procedures are necessary.

**Areas surrounding the project area, assessing potential impact**

| Unit Below    | Unit Above    | Lateral         | Lateral    | Behind        | Front           |
|---------------|---------------|-----------------|------------|---------------|-----------------|
|               |               |                 |            |               |                 |
| Risk Group-NA | Risk Group-NA | Risk Group-High | Risk Group | Risk Group-NA | Risk Group-High |

**NOTE:****General Requirements:**

- Vacuum off dust, construction dust, drywall dust and mud, etc. before leaving Class II, III, or IV Containment.
- Do not use dry dust mop. Use damp mop, dust control spray, or dust control sweeping compound.
- Use walk-off mats in Class II, III, or IV Containment.

**NOISE AND VIBRATION:****Site inspection and detail of plan:**

Date:

**Infection Control: Jamie Yarberry****Safety: Kim Mashburn****Engineering: Jon Miller**



**SECTION 01 00 00**  
**GENERAL REQUIREMENTS**

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**SECTION 01 00 00**  
**GENERAL REQUIREMENTS**

**1.1 GENERAL INTENTION**

- A. Contractor shall completely prepare site for building operations, including demolition and removal of select portions of existing structures, and furnish labor and materials and perform work for the addition of a Substance Abuse Building (SAB) Out-Patient Building Wing to the Eugene Towbin Veteran's Affairs Medical Center (Building 170) as required by drawings and specifications.
- B. Before placement and installation of work subject to tests by testing laboratory retained by Department of Veterans Affairs, the Contractor shall notify the Project Engineer in sufficient time to enable testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the Project Engineer.
- C. All employees of general contractor and subcontractors shall comply with VA security management program and obtain Identification Badges.
- D. 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.
- E. Training:
  - 1. Beginning July 31, 2005, all employees of general contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by VA CP with input from the ICRA team.
  - 2. Submit training records of all such employees for approval before the start of work.

**1.2 STATEMENT OF BID ITEM(S) - NA**

**1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR**

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

**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. They may also be subject to inspection of their personal effects when entering or leaving the project site.
  - 2. For working outside the "regular hours" as defined in the contract, The General Contractor shall give 3 days notice to the Contracting Officer 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. No photography of VA premises is allowed without written permission of the Contracting Officer.

4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.
- C. Key Control:
1. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation. See Section 08 71 00, Door Hardware and coordinate.

## 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):  
E84-2007 .....Surface Burning Characteristics of Building Materials
  2. National Fire Protection Association (NFPA):  
10-2006.....Standard for Portable Fire Extinguishers  
30-2003.....Flammable and Combustible Liquids Code  
51B-2003.....Standard for Fire Prevention During Welding, Cutting and Other Hot Work  
70-2005.....National Electrical Code  
241-2004.....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 Project Engineer 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 Project Engineer 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 separations between construction areas and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. At door openings, install 1¾ solid core doors with self-closing devices.
  2. Install temporary construction partitions as shown on drawings to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.
  3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials promptly in accordance with Section 07 84 00, FIRE-STOPPING.

- 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 Project Engineer.
- H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Project Engineer.
- I. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- J. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- K. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with Project Engineer. 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 Project Engineer.
- L. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Project Engineer.
- M. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Project Engineer. Prepare permits at least 8 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- N. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Project Engineer.
- O. Smoking: Smoking is prohibited inside existing buildings and additions under construction.
- P. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- Q. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.

## **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.
- D. Working space and space available for storing materials shall be as determined by the Project Engineer.

- E. Workmen are subject to rules of Medical Center applicable to their conduct.  
Execute work in such a manner as to interfere as little as possible with work being done by others. Keep roads clear of construction materials, debris, standing construction equipment and vehicles at all times.
- F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by Project Engineer where required by limited working space.
  - 1. Do not store materials and equipment in other than assigned areas.
  - 2. 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.
  - 3. 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.
- G. 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 Project Engineer.

## **1.7 ALTERATIONS**

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the Project Engineer and a representative of VA AMMS Service, of areas of buildings in which alterations occur and areas which are anticipated routes of access. The COTR shall video tape the walk-thru documenting:
  - 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 such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
  - 3. Shall note any discrepancies between drawings and existing conditions at site.
  - 4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and Project Engineer.
- 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 Project Engineer, 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) of Section 00 72 00, GENERAL CONDITIONS.

- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and Project Engineer together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
  - 1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.
- D. Protection: Provide the following protective measures:
  - 1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
  - 2. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
  - 3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

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

Comply with Specification 000501 concerning dust control.

#### **1.9 DISPOSAL AND RETENTION**

- A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:
  - 1. Reserved items which are to remain property of the Government will be identified at the beginning of the job. The contractor will set them aside for pick-up by the VA. 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.
  - 2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.

#### **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 workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the

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

#### **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 Project Engineer. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the Project Engineer before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are indicated on drawings and which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2) of Section 00 72 00, GENERAL CONDITIONS.

#### **1.12 PHYSICAL DATA : NA**

#### **1.13 PROFESSIONAL SURVEYING SERVICES: NA**

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

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

#### **1.15 AS-BUILT DRAWINGS**

- A. The contractor shall maintain one 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 Project Engineer's review, as often as requested.

- C. Contractor shall deliver two approved completed sets of as-built drawings to the Project Engineer within 15 calendar days after each completed phase and after the acceptance of the project by the Project Engineer.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

#### **1.16 USE OF ROADWAYS**

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the Project Engineer, 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.
- B. When new permanent roads are to be a part of this contract, Contractor may construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.
- C. When certain buildings (or parts of certain buildings) are required to be completed in advance of general date of completion, all roads leading thereto must be completed and available for use at time set for completion of such buildings or parts thereof.

#### **1.17 PROJECT ENGINEER'S FIELD OFFICE: NA**

#### **1.18 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT**

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



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

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

### **1.20 TEMPORARY USE OF NEW ELEVATORS: NA**

### **1.21 TEMPORARY TOILETS**

- A. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workmen. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets. Contractor should ensure that mud, paint, tar, etc. is not tracked from the work site.

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

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing convenience outlets and supplies. Convenience outlets are located throughout the facility. The contractor will need to set a temporary panel for power until permanent panels are installed and energized before new panels are called for. 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. 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:

### **1.23 NEW TELEPHONE EQUIPMENT: NA**

### **1.24 TESTS**

- A. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- B. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- C. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire complex which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a complex which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.

- D. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonably short period of time during which operating and environmental conditions remain reasonably constant.
- E. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

## **1.25 INSTRUCTIONS**

- A. Contractor shall furnish Maintenance and Operating manuals and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals (four copies each) for each separate piece of equipment shall be delivered to the Project Engineer 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 Project Engineer and shall be considered concluded only when the Project Engineer 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 Project Engineer, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

**1.26 GOVERNMENT-FURNISHED PROPERTY: NA**

**1.27 RELOCATED // EQUIPMENT // ITEMS: NA**

**1.28 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT: NA**

**1.29 CONSTRUCTION SIGN: NA**

**1.30 SAFETY SIGN: NA**

**1.31 CONSTRUCTION DIGITAL IMAGES: NA**

**1.32 FINAL ELEVATION DIGITAL IMAGES: NA**

**1.33 HISTORIC PRESERVATION**

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

- - - E N D - - -

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

**PART 1 – GENERAL**

- 1.1. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in Section 00 72 00, 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 Contracting Officer, and action thereon will be taken by Resident Engineer on behalf of the Contracting Officer.
- 1.6. Upon receipt of submittals, Resident-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 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 Resident Engineer at the site until completion of contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.
- 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 Contracting Officer (90C/NLR), Central Arkansas Veterans Healthcare System, 2200 Fort Roots Drive – Bldg. 41, North Little Rock, Arkansas 72114

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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 Resident Engineer. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Resident Engineer to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to Resident Engineer, Contractor, unless other arrangements are agreed to in writing by the Resident Engineer. Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Resident Engineer immediately of any irregularity.

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

## **PART 3 - EXECUTION**

### **3.1 EARTHWORK:**

- A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:
1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Resident Engineer extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
  2. Provide 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 ASTM D698 and/or ASTM D1557.
  2. Make field density tests in accordance with the primary testing method following ASTM D2922 wherever possible. Field density tests utilizing ASTM D1556 or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Resident Engineer before the tests are conducted.
    - a. Building Slab Subgrade: At least one test of subgrade for every 185 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 Resident Engineer. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.
- C. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- D. Testing Materials: Test suitability of on-site and off-site borrow as directed by Resident Engineer.

### **3.2 DRILLED PIERS:**

- A. Review Contractor's equipment, methods, and procedures prior to starting any work on site. Provide continuous inspection of pile installation. Maintain a record of all pertinent phases of operation for submittal to Resident Engineer.
- B. Drilled Piers: Test concrete including materials for concrete as required in Article CONCRETE of this section, except make two test cylinders for each day's production of each strength of concrete produced.

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

- A. Aggregate Base Course:
1. Determine maximum density and optimum moisture content for aggregate base material in accordance with ASTM D1557, Method D.
  2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with ASTM D1556.
  3. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.
- B. Asphalt Concrete:

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

### **3.4 SITE WORK CONCRETE:**

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 Resident Engineer with concurrence of Contracting Officer and perform periodic inspections thereafter as determined by Resident Engineer.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Resident Engineer.
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. Label each cylinder with an identification number. Resident Engineer may require additional cylinders to be molded and cured under job conditions.
4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump.
5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 20 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 Resident Engineer with the results of all profile tests, including a running tabulation of the overall  $F_F$  and  $F_L$  values for all slabs installed to date, within 72 hours after each slab installation.
  19. Other inspections:
    - a. Grouting under base plates.
    - b. Grouting anchor bolts and reinforcing steel in hardened concrete.
- C. Laboratory Tests of Field Samples:
1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by Resident Engineer. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.

2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
3. Furnish certified compression test reports (duplicate) to Resident Engineer. In test report, indicate the following information:
  - a. Cylinder identification number and date cast.
  - b. Specific location at which test samples were taken.
  - c. Type of concrete, slump, and percent air.
  - d. Compressive strength of concrete in MPa (psi).
  - e. Weight of lightweight structural concrete in  $\text{kg/m}^3$  (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. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.
- C. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.
- D. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

### **3.7 ARCHITECTURAL PRECAST CONCRETE:**

- A. Inspection at Plant: Forms, placement of reinforcing steel, concrete cover, and placement and finishing of concrete.
- B. Concrete Testing: Test concrete including materials for concrete as required in Article CONCRETE of this section, except make two test cylinders for each day's production of each strength of concrete produced.
- C. Inspect members to insure specification requirements for curing and finishes have been met.

### **3.8 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.

### **3.9 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. 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.
- C. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Resident Engineer.

### **3.10 STEEL DECKING:**

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

### **3.11 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 Resident Engineer.
- 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 Resident Engineer.

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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 sediment basins. 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 00, EARTH MOVING.
  - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
- 5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features shown on the Environmental Protection Plan. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
- 6. Manage borrow areas on and off Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
- 7. Manage and control spoil areas on and off Government property to limit spoil to areas shown on the Environmental Protection Plan and prevent erosion of soil or sediment from entering nearby water courses or lakes.
- 8. Protect adjacent areas from despoilment by temporary excavations and embankments.
- 9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on

- a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
  11. Handle discarded materials other than those included in the solid waste category as directed by the Resident Engineer.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
  2. Control movement of materials and equipment 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 Arkansas and the requirements of the Arkansas Department of Environmental Quality, and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
  2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment,

baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.

3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
  4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Resident Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00 p.m unless otherwise permitted by local ordinance or the Resident Engineer. Repetitive impact noise on the property shall not exceed the following dB limitations:

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

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



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

- b. Use shields or other physical barriers to restrict noise transmission.
  - c. Provide soundproof housings or enclosures for noise-producing machinery.
  - d. Use efficient silencers on equipment air intakes.
  - e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
  - f. Line hoppers and storage bins with sound deadening material.
  - g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the 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 77 01 FINAL CLEANING**

### **PART 1. GENERAL:**

#### **1.1 SUMMARY**

This section includes administrative and procedural requirements for final cleaning.

#### **1.2 ACTION SUBMITTALS**

Product Data: For cleaning agents.

### **PART 2 – PRODUCTS**

#### **2.1 MATERIALS**

Cleaning Agents: use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

### **PART 3 – EXECUTION**

#### **3.1 FINAL CLEANING**

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to be smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- j. Strip ( if needed) and wax appropriate floors. VA will supply stripper, wax and finisher. Apply 3 coats of wax.
- k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- l. Remove labels that are not permanent.
- m. Wipe surfaces of mechanical and electrical equipment (elevator equipment) and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- q. Leave Project clean and ready for occupancy.

- - - END - - -

**SECTION 01 81 13**  
**SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This guide specification covers the requirements for providing documentation related to items pursued in the GBI GREEN GLOBES™ Building Rating System. The Contractor is wholly responsible for complying with all the requirements and providing documentation for all items attempted toward the required GREEN GLOBES™ rating.
- B. 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.
- C. GREEN BUILDING INITIATIVE (GBI)  
GREEN GLOBES™ Building Rating System
- D. FOREST STEWARDSHIP COUNCIL (FSC)  
(2000) Principles and Criteria for Forest Stewardship
- E. Federal Building Energy Codes
- F. ASHRAE 15-1994
- G. ASHRAE 55-2004
- H. ASHRAE Standard 90.1-2004 with Addendum E
- I. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality
- J. ASHRAE Standard 52.2-1999, Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size
- K. US EPA Emission Factors, Section 1.4

**1.2 DEFINITIONS**

- A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," or other bodies mentioned above. Certificates shall include evidence that manufacturer is certified for chain of custody.
- B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

- C. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles (800 km) from Project site. Manufacturing refers to the final assembly of components into the building product that is installed at Project site.
- D. Regionally Extracted and Manufactured Materials: Regionally manufactured materials made from raw materials that are extracted, harvested, or recovered within a radius of 500 miles (800 km) from Project site.
- E. Recycled Content: The recycled content value of a material assembly shall be determined by weight.
  - 1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
  - 2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.
- F. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).
  - 1. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
  - 2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

### **1.3 SUBMITTALS**

- A. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
  - 1. Furniture.
  - 2. Plumbing.
  - 3. Mechanical.
  - 4. Electrical.
  - 5. Specialty items such as elevators and equipment.
  - 6. Wood-based construction materials.

- B. GREEN GLOBES Implementation Plan: Provide preliminary submittals within 60 days of date established for the Notice to Proceed indicating how all Green Globes requirements will be met, including lists of all materials to be used and their product data sheets.
- C. GREEN GLOBES Final Design Documentation: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with GREEN GLOBES Implementation Plan.
- D. GREEN GLOBES Documentation Notebook: This close-out submittal must include all documentation required for GREEN GLOBES certification, including:
  - 1. C&D Waste Management Plan
  - 2. Construction Activity Pollution Prevention Plan
  - 3. All materials product information, including recycled content, regional materials information, and volatile compounds information
  - 4. Waste and recycle logs
  - 5. All previous GREEN GLOBES submittals
  - 6. Meeting notes

#### **1.4 DESCRIPTION**

- A. This project has been designed for, and shall be developed for a sustainable rating of TWO GREEN GLOBES™ in accordance with GBI. The following sections identify the documentation required for certification. No variations or substitutions to the GREEN GLOBES™ items identified for this contract shall be allowed without written consent from the Contracting Officer. Should there be a case where there is any problem meeting the full requirements of a GREEN GLOBES™ item identified for this project, the Contractor must bring this to the attention of the Contracting Officer immediately.
- B. GREEN GLOBES™ compliance shall be in accordance with the GREEN GLOBES™ RATING SYSTEM. Documentation shall be modified as necessary to conform to any additional or modified submittal requirements identified in the GREEN GLOBES™ RATING SYSTEM.

## **1.5 CREDIT VALIDATION**

- A. This project will be registered with GBI for validation of credits earned. Contractor is not responsible for registering the project with GBI or for paying associated project registration fees. Format and content of all construction documentation must be in accordance with the GBI requirements for supporting data required in event of GBI audit of the particular credit. Contractor is required to coordinate through the Contracting Officer with Sustainability consultant on assuring assembled data is acceptable to GBI and responding to GBI requests for additional construction data in the course of seeking project certification. A Sustainability Consultant will be responsible for assembling documentation and ensuring that GREEN GLOBES™ credits are earned and documented as required by this specification section for all phases of the project. The Sustainability Consultant shall be identified on the Contractor's Quality Control Staff.
- B. The Contractor shall review all requests for information, proposals, modifications, deviations from the design documents, or any other items that could potentially impact the GBI rating of the project.

## **1.6 CONTRACTOR RESPONSIBILITIES**

- A. Some GREEN GLOBES credits are inherent in the design provided and require no further submittal or documentation. For these credits, the Contractor is to notify the Contracting Officer in advance of selection of any specified material or use of any permissible construction methods that may result in a deviation from the GBI designer intent. Deviations from the accepted design may impact the GBI rating of the project. In any case where a pending action, either by the Contractor or the Government, may cause failure to meet the requirements of an attempted GREEN GLOBES credit, the Contractor shall bring this to the attention of the Contracting Officer immediately. Some GREEN GLOBES credits involve material selection and are generally identified within the technical sections with the notation "GREEN GLOBES," though not specifically identified in all occurrences. Some GREEN GLOBES credits are dependent on construction practices.
- B. In all cases where a material, product, or execution requirement is identified by "GREEN GLOBES" in the contract documents, additional data or certificates shall be submitted with the individual component or process validating the material or component to the respective GREEN GLOBES credit item. These additional data or certificates shall be separable from the other submitted data and a copy shall be included in the GREEN GLOBES Documentation Notebook in addition to the distribution indicated in the submittal register.



## **1.7 DOCUMENTATION**

- A. The Contractor shall be responsible for complying with the requirements of the credits attempted as indicated on the GREEN GLOBES Checklist. The Contractor shall also be responsible for providing documentation for each credit attempted as described below and the Submittal Checklist. The Contractor shall provide documentation indicated to be required at the Preconstruction stage with the GREEN GLOBES Implementation Plan. Documentation required at Construction Closeout shall be submitted with the GREEN GLOBES Documentation Notebook. Documentation indicated to be provided quarterly shall be updated monthly.
- B. The project will be registered with GBI on [www.greenglobes.com](http://www.greenglobes.com) by others. The Contractor shall coordinate with the Sustainability Consultant. The Sustainability Consultant of the online checklist shall coordinate with Team Members and monitor documentation. The Sustainability Consultant shall assign the Contractor and other Team Members access for review of the online checklist.

## **1.8 CERTIFICATION TO BE ACHIEVED: TWO GREEN GLOBES**

- A. Requiring minimum of 55% score.

## **1.9 PROJECT MANAGEMENT**

- A. Procurement Policy: Follow the established Environmental Purchasing Policy (EPP) that will apply to all procurement or contracting decisions related to the project.
  - 1. Document the commitment to select products and services that will reduce the volume of waste, the material costs and the toxicity of products, and that will support reuse and recycling.
  - 2. Suppliers shall provide information on the environmental characteristics and resource efficiency of their products.
  - 3. Construction products and services shall meet criteria of the Environmental Choice Program or a similar program. Steel and aluminum shall be purchased from producers that participate in recycling programs.
  - 4. Environmental purchasing shall include the procurement of energy-efficient equipment reflecting green and/or ENERGY STAR aspects.

## **PART 2 PRODUCTS**

### **2.1 SITE**

- A. The environmental goals and objectives must be clearly communicated to the entire construction team to ensure that they are aware of their responsibilities, the deliverables and the expected results. These issues shall be addressed continually during project meetings.
  - 1. There shall be minimal disturbance to areas on the site which will not be built upon.
  - 2. The roof shall bear high-albedo (highly-reflective) roofing materials with a reflectance of at least 0.65 and emissivity of at least 0.9 for a minimum of 75% of the roof surface.

3. Heat Islands: All site concrete paving, including walkways and parking, shall use light-colored, high-albedo materials with at least 30% reflectance values. Documentation of reflectance and emittance (Solar Reflectivity Index [SRI]) values shall be provided in contractor's submittals.
  4. An ecologically appropriate staging area shall be selected to store construction equipment and materials, which will limit disturbance to the site.
- B. Watershed, Groundwater, and Stormwater – The site's watershed and groundwater shall be preserved.
1. Develop a Stormwater Management Plan. Include erosion and sediment control measures to be taken during construction in order to prevent soil loss, sedimentation, and to protect vegetation and wildlife habitats.
  2. Site grading shall be used to increase infiltration, reduce run-off and divert water from the building.

## **2.2 ENERGY**

- A. Building Envelope
1. Insulation installation shall be optimized to minimize heat losses or heat gains through the building envelope.
  2. Glazing with a low U-factor shall be used, taking into consideration the building function, orientation, and the climate. Minimum requirements are to meet the Federal Building Energy Codes.
  3. The integrity of the building envelope shall be assured using air/vapor barrier best practices. Materials to be used shall meet or exceed the ASHRAE 90.1-2004 or State Energy Building Codes standards with respect to thermal resistance and maintaining interior comfort.
  4. Materials, insulation, and sealing strategies shall be used to prevent groundwater or driven rain from penetrating the building.
  5. A systematic approach shall be used to provide a continuity of an air barrier, including areas where dissimilar materials meet.
- B. Energy Efficient Systems
1. High efficiency lamps, luminaires with electronic ballasts, complemented by appropriate task lighting and occupancy sensor lighting controls shall be used.
  2. Low-flow aerators shall be installed on all faucets and showerheads.
- C. Alternative Transportation
1. There shall be designated priority parking spaces for carpoolers.

## **2.3 WATER**

- A. The building shall have water-conserving urinals with a flow rate of no more than 1.0 gallons/flush.
- B. The building shall have low-flow toilets with a maximum of 1.6 gallons/flush.

- C. There shall be aerators on faucets that reduce water use.
- D. All dishwashers, washing machines, and kitchen faucets are to be low-flow or low consumption appliances.
- E. All contractors, subcontractors and installers are to use water-efficient practices onsite during the construction process, including the reclamation of water used in power washing, and minimal water usage for irrigation and dust control.

## **2.4 RESOURCES, BUILDING MATERIALS AND SOLID WASTE**

- A. Meetings between the contractor, subcontractors and installers shall be held to ensure that all material installations meet the following environmental objectives.
- B. Develop a Construction, Demolition and Renovation (C&D) Waste Management Plan into the project delivery process.
  - 1. Describe how building materials will be reused or recycled.
  - 2. Indicate responsibilities for implementation, timing and expected results.
  - 3. Include a source separation workplan, and a plan for removing and properly disposing of hazardous products or materials.
- C. Provide separate areas for waste separation, storage, and handling for consumer recyclables. The areas must be clearly marked and easily accessible.
- D. All solid lumber and timber panel products shall be approved by the CSA (Canadian Standards Association), the FSC (Forestry Stewardship Council), the Sustainable Forestry Initiative (SFI), or the American Tree Farm System (ATFS). Tropical hardwoods shall not be used. Chain-of-custody certificates shall be supplied for all lumber.
- E. Provide documentation of recycled content for all materials possible. Be sure documentation includes pre- and post-consumer content if possible.
- F. Provide documentation of extraction and manufacture distances for all materials possible.

## **2.5 EMISSIONS, EFFLUENTS AND OTHER IMPACTS**

- A. Where practicable, building components and materials shall be selected that require minimal use of hazardous materials for their maintenance.
- B. Hazardous materials shall be stored in securely locked areas with proper ventilation, controlled temperatures, drain protection and adequate shelf space. Worker training, access to MSDS sheets, and spill clean-up procedures shall be provided as well.

## **2.6 INDOOR ENVIRONMENT**

- A. The filtration system shall meet ASHRAE Standard 52.2-1999, Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size, and shall have a Minimum Efficiency Reporting Value (MERV) of at least 13.

- B. All interior materials including paints, adhesives, and sealants shall be low-VOC (volatile organic compounds) materials. Product data sheets must be supplied to the sustainability consultant.

## **2.7 GREEN GLOBES DOCUMENTATION NOTEBOOK**

- A. The Contractor shall prepare a comprehensive notebook documenting compliance for each GREEN GLOBES credit. GREEN GLOBES Documentation Notebook shall be formatted to match this specs outline and tabbed for each section. Documentation in the notebook shall contain up to date information through the previous month's work, and at least one set shall be available on the jobsite at all times. The Notebook may be maintained and available for reference electronically if preferred. Completed pages shall be prevented from being altered. If the Contractor fails to maintain the GREEN GLOBES Documentation Notebook as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the Notebook. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of the Notebook. The original, one copy, and an electronic version on CD of the notebook shall be submitted at project closeout.

## **2.8 CONTENT**

- A. The notebook shall include applicable product data for material selection, final calculations, certifications for construction practices, procurement data, cumulative calculations and other items as identified in the approved GREEN GLOBES Implementation Plan. Notebook must contain all required data to support full compliance with the indicated GREEN GLOBES credit. Credits that are inherent to the design will be documented by the designer of record.

## **2.9 CALCULATIONS**

- A. Calculations showing compliance with a required GREEN GLOBES credit shall be identified within the GREEN GLOBES Implementation Plan. Calculations shall be current and available for monthly review. Final calculations shall be included in the GREEN GLOBES Documentation Notebook under the appropriate tab.

## **2.10 SUBMITTALS**

- A. All "G" designated submittals required for inclusion in the GREEN GLOBES Documentation Notebook shall be separable from other submitted data and shall be included in the GREEN GLOBES Documentation Notebook in addition to the distribution indicated on the submittal register.

## **PART 3 EXECUTION**

### **3.1 COORDINATION MEETINGS**

- A. There will be three onsite coordination meetings. The first will be a preconstruction meeting to review the GREEN GLOBES Implementation Plan. The requirements for this meeting may be fulfilled during the coordination and mutual understanding meeting. The second will be a pre-closeout meeting to review GREEN GLOBES Documentation Notebook for completeness and identify any outstanding issues relating to final score and documentation requirements. The third is a closeout meeting to review the final GREEN GLOBES Documentation Notebook. All meetings shall be attended by Contractor's designated individual responsible for GREEN GLOBES documentation, Government representative and Installation representative. At closeout meeting a final score for the project will be determined based on review of project performance and documentation. Contractor shall make a set of contract drawings and specifications available for review at each meeting as well as an updated GREEN GLOBES Documentation Notebook.

### **3.2 COMMISSIONING**

- A. Provide commissioning documentation in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS for all inspection, start up, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.
- B. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS and related sections for contractor responsibilities for system commissioning.

--- E N D ---

**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 CxA 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 22, Division 23, and Division 26 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. The specified startup, testing and adjusting services shall be provided and copies of the documentation shall be submitted to the VA and CxA for commissioning purposes as required by this specification.
- 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 shall be submitted to the VA and the CxA for commissioning purposes as required by this specification.
- D. Where training or educational services for VA are required and specified in other sections of the specifications, including but not limited to Division 1, Division 22, Division 23, and Division 26 series sections of the specification, these services are intended to be provided in addition to the training and educational services specified herein. Copies of all training and educational services documentation shall be submitted to the VA and CxA for commissioning purposes as required by this specification.
- 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 phase 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 all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
  4. Verify that the VA's operating personnel are trained per the contract document requirements to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
  5. Document the successful achievement of the commissioning objectives listed above.
- F. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

## **1.2 CONTRACTUAL RELATIONSHIPS**

- A. For this construction project, the Department of Veterans Affairs contracts with a Contractor to provide construction services. The contracts are administered by the VA Contracting Officer and the Resident Engineer as the designated representative of the Contracting Officer. On this project, the authority to modify the contract in any way is strictly limited to the authority of the Contracting Officer and the Resident Engineer.
- B. In this structure, only two contract parties are recognized and communications on contractual issues are strictly limited to VA Resident Engineer and the Contractor. It is the practice of the VA to require that communications between other parties to the contracts (Subcontractors and Vendors) be conducted through the Resident Engineer and Contractor. It is also the practice of the VA that communications between other parties of the project (CxA and Architect/Engineer) be conducted through the Resident Engineer.
- C. Whole Building Commissioning is a process that relies upon frequent and direct communications, as well as collaboration between all parties to the construction process. By its nature, a high level of communication and cooperation between the CxA 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 CxA must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Contracting Officer and Resident Engineer. Thus, the procedures outlined in this specification must be executed within the following limitations:

1. No communications (verbal or written) from the CxA 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 CxA will be delivered to the Resident Engineer and copied to the designated Commissioning Representatives for the Contractor and Subcontractor 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 CxA and as suggestions for resolution.
3. In the event that any Commissioning Issues and suggested resolutions are deemed by the Resident Engineer to require either an official interpretation of the construction documents or require a modification of the contract documents, the Contracting Officer or Resident Engineer will issue an official directive to this effect.
4. All parties to the Commissioning Process shall be individually responsible for alerting the Resident Engineer of any issues that they deem to constitute a potential contract change prior to acting on these issues.
5. Authority for resolution or modification of design and construction issues rests solely with the Contracting Officer or Resident Engineer, with appropriate technical guidance from the Architect/Engineer and/or Commissioning Agent.

### **1.3 RELATED WORK**

- A. Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.
- B. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.
- C. 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 Green Buildings Initiative Green Globes rating program and to support delivery of project performance in accordance with the VA requirements developed for the project.

### **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 CxA 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 CxA 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, Resident Engineer, 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 CxA.
- B. The following systems will be commissioned as part of this project:
  - 1. Plumbing (Division 22)
    - a. Domestic Hot Water systems (Domestic water heaters, steam-to-hot water converters, hot water circulating pumps and motors, controls).
    - b. Domestic Water Booster Pumps (Controls, piping, compression tanks, pumps, motors, and Variable Speed Drives).
  - 2. 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. Fan Coil Units and Air Terminal Units.
    - c. Heating Hot Water Systems (Steam Convertors, controls, instrumentation and gages, heating water pumps and motors, Variable Speed Drives, expansion tanks).

- d. Condensate Return Systems (Condensate receivers and transfer pumps, motors, controls, pump alternator, alarms and instrumentation, safeties).
  - e. Chilled Water Systems (Water Chillers, Free Cooling Plate Frame Heat Exchanger, chilled water pumps and motors, Variable Speed Drives, chiller motor/compressor, controls, instrumentation and safeties, isolation valves, blending valves, side stream water cleaners/scrubbers/filters, expansion tanks).
  - f. Condenser Water Systems for Chillers (Cooling Towers, condenser water pumps and motors, Variable Speed Drives, cooling tower fans, cooling tower sump level controls, open-circuit water treatment system, water treatment injection pumps and motors, water treatment controls, cooling tower basin heaters and controls, side stream water cleaners/scrubbers/filters, tower bypass valves).
  - g. Exhaust Fans (Fan, motor, Variable Speed Drives, controls and safeties).
  - h. 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).
  - i. HVAC Water Treatment Systems (Closed circuits – including shot feeders and final water analysis, open circuits – including water analysis, chemical/biocide tanks, injection piping, chemical/biocide pumps and motors, controls, water meter, and automatic blowdown).
3. Electrical (Division 26)
- a. Lighting Controls (Control system hardware and software, scene settings, zone settings, occupancy sensor interface, and unoccupied cycle control).

## **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 Subcontractor, installers, suppliers, and specialists deemed appropriate by the Department of Veterans Affairs (VA) and CxA.

**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 CxA. SSRCx will be the CxA for this project.
- 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 and all construction document revisions, prepared by Architect and approved by VA, to the CxA and for use in managing the commissioning process, developing the Commissioning Plan, 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 Subcontractor.
- B. The Contractor shall provide the following information to the CxA:
  1. A copy of the final Architect/Engineer approved submittal data for each item of equipment or system to be commissioned.
  2. A copy of the Owner Training Plan including all Owner Training documentation.
- C. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that the Subcontractors comply with the requirements of these specifications.
- D. 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 CxA.
8. Provide information to the CxA 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. The Commissioning Plan will include the project specific Pre-Functional Checklists and systems Functional Performance Test procedures.
- C. Review selected submittals from the Contractor for commissioning purposes only including preparation of the Commissioning Plan and 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.
- D. At the beginning of the construction phase, conduct a commissioning "kick-off" meeting for the purpose of reviewing the Commissioning Plan and establishing tentative schedules for equipment submittals, Pre-Functional Checklist completion, Equipment Startup, TAB work, Control Systems work, Systems Functional Performance Testing, Operation and Maintenance Training sessions; 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

CxA shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting. Typically, commissioning issues will be dealt with during the Contractor progress meetings attended by the CxA during periodic site visits.

Dedicated commissioning team meetings will only be convened if necessary.

- F. Verify selected Pre-Functional Checklists completed and submitted by the Contractor.
- G. Witness and document Systems Functional Performance Testing.
- H. Prepare Commissioning Site Visit Reports.
- I. Review operation and maintenance training program developed by the Contractor. Verify training plans provide qualified instructors to conduct operation and maintenance training. Monitor completion of Owner Training exercises.
- J. Prepare the Final Commissioning Report.

#### **1.11 COMMISSIONING DOCUMENTATION**

- A. Commissioning Plan: A document, prepared by CxA 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. A narrative describing the commissioning process.
  - 2. Identification of systems and equipment to be commissioned.
  - 3. Description of responsibilities of commissioning team members.
  - 4. Pre-Functional Checklists for all commissioned equipment.
  - 5. Systems Functional Performance Test procedures.
  - 6. Commissioning Activities Schedule: Identification of Commissioning activities and deliverables, prerequisites for the activity and the expected duration of the activity.
  - 7. Owner Training Matrix outlining the contract document requirements for Owner Training for the commissioned systems.
- B. Systems Functional Performance Test Procedures: The CxA 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. 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. Time and date of test.

3. Indication of whether the record is for a first test or retest following correction of a problem or issue.
  4. Individuals present for test.
  5. Observations and Issues.
  6. Issue number, if any, generated as the result of test.
- C. Pre-Functional Checklists: The CxA 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 CxA 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 CxA 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. CxA will compile test and inspection reports and test and inspection certificates and include them in the Final Commissioning Report.
- E. Corrective Action Documents: The CxA 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 CxA will witness and document any retesting of systems and/or equipment requiring corrective action and document retest results. Time for the CxA to direct any retesting required due to repeated testing failures or because a specific Pre-Functional Checklist or Startup Plan test item reported to have been successfully completed, but determined during Functional Performance Testing to be faulty, will be “back-charged” to the Contractor (refer to paragraph 3.5-H, 3.5-I and 3.6-C).
- F. Commissioning Issues Log: The CxA will prepare and maintain Commissioning Issues Log that describes Commissioning Issues and Commissioning Observations that are identified during the Commissioning process. These observations and issues include, but are not limited to, those that are at variance with the Contract Documents. The Commissioning Issues Log will identify and track issues as they are encountered, the party responsible for resolution, progress toward resolution, and document how the issue was resolved. The Master Commissioning Issues Log will also track the status of unresolved issues.
1. Creating a Commissioning Issues Log Entry:
    - a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
    - b. Assign a descriptive title for the issue.

- c. Identify date and time of the issue.
  - d. Identify system, subsystem, and equipment to which the issue applies.
  - e. Include information that may be helpful in diagnosing or evaluating the issue.
  - f. Note recommended corrective action.
  - g. Identify commissioning team member responsible for corrective action.
2. Documenting Issue Resolution:
- a. Log date correction is completed or the issue is resolved.
  - b. Describe corrective action or resolution taken if applicable.
  - c. Identify person(s) verifying the issue resolution.
- G. Final Commissioning Report: The CxA 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.
  - 2. Pre-Functional Checklists completed by the Contractor.
  - 3. Systems Functional Performance Test Procedures, with annotation of test results and test completion.
  - 4. Commissioning Issues Log.
  - 5. Listing of deferred test(s) not performed, including the schedule for their completion.
- H. Addendum to Final Commissioning Report: If deferred testing is required after the delivery of the Final Commissioning Report, the CxA will prepare an Addendum to the Final Commissioning Report that will include the following:
- 1. Documentation of deferred test(s) results.

## **1.12 SUBMITTALS**

- A. Commissioning Plan Submittal: The CxA will prepare a Commissioning Plan based on the final Construction Documents. The CxA will submit three hard copies and three electronic CD files of the Commissioning Plan prior to the construction phase Commissioning “Kick-Off” meeting (see



paragraph 1.10-D) for review by the Contractor and VA. The Contractor shall review the Commissioning Plan and provide any comments to the VA. The Commissioning Plan review comments will be discussed and reviewed during the construction phase commissioning “Kick-Off” meeting. The CxA will revise the Commissioning Plan to incorporate any review comments if required.

- B. Equipment Submittals: The CxA will review the final Architect/Engineer approved submittal data for the equipment to be commissioned and revise the Commissioning Plan Pre-Functional Checklists and Functional Performance Testing procedures if required.
- C. Commissioning Site Visit Reports: The CxA will submit site visit reports to the VA with copies to the Contractor and Architect/Engineer. The commissioning site visit reports will include the Commissioning Issues Log.
- D. Final Commissioning Report Submittal: The CxA will submit one hard copy and one electronic copy of the Final Commissioning Report to the VA.
- E. Data for Commissioning:
  - 1. The Contractor will provide the following specific information needed about each piece of commissioned equipment or system to fulfill requirements of commissioning:
    - a. Architect/Engineer approved submittal data.
    - b. Manufacturer Startup documentation.
    - c. Operation & Maintenance documentation (if requested by CxA).

### **1.13 COMMISSIONING PROCESS**

- A. The CxA 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 //10// 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 //20// 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 CxA will coordinate the commissioning activities with the VA and Contractor. The CxA 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 CxA and the VA to incorporate the commissioning activities into the construction schedule. The CxA 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 CxA 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 CxA.
- D. Commissioning Coordinating Meetings: The CxA 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. Typically, these meetings will be held during the regularly scheduled Contractor progress meetings attended by the CxA during periodic site visits.

- E. Pretesting Meetings: The CxA 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 CxA.
- 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 CxA 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) Any equipment or systems testing documentation required by the Division 01, 22, 23 or 26 specifications (e.g. ductwork pressure testing, ductwork cleaning, piping pressure testing, piping cleaning and flushing, etc.)
    - 3) 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.
    - 4) The manufacturer's normally used field checkout sheets.
      - a) The Contractor will submit the full startup plan to the VA and CxA for review. Final approval will be by the VA.
      - b) The Contractor shall submit one copy of the final executed startup plan (including the completed startup documentation for all commissioned equipment/systems) to the VA and CxA prior to beginning Systems Functional Performance Testing.
- 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 Startup 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 CxA. The performance of the startup and checkout shall be directed and executed by the Contractor.
  - b. The CxA may observe the startup procedures for selected pieces of primary equipment during periodic site visits.
  - c. The Contractor shall execute startup and provide the VA and CxA 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 CxA within two days of completion.
- B. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the VA and CxA 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 CxA will review the final Contractor executed Startup Plan report and for approval to the VA and determine if the commissioning process can proceed to Systems Functional Performance Testing.
- C. The Contractor shall be responsible for resolution of deficiencies as directed the VA.

### **3.3 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 as required by the Division 23 control system specifications. Any trending required by the CxA for commissioned systems prior to systems functional performance testing in addition to the Division 23 control systems

specifications will be included with the Commissioning Plan Systems Functional Performance Test procedures.

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

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

| <b>SYSTEM</b>             |                              |  |
|---------------------------|------------------------------|--|
| <b>Sensor</b>             | <b>Calibration Frequency</b> | <b>O&amp;M Calibration Procedure Reference</b> |
| Discharge air temperature | Once a year                  | Volume I Section D.3.aa                        |
| Discharge static pressure | Every 6 months               | Volume II Section A.1.c                        |

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

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

### **3.4 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 CxA 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 CxA in developing the Systems Functional Performance Test procedures as requested by the CxA i.e. by answering questions about equipment, operation, sequences, etc. Prior to execution, the CxA 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 CxA 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. Date
  4. Project name
  5. Participating parties

6. Required pretest field measurements
  7. Instructions for setting up the test.
  8. Special cautions, alarm limits, etc.
  9. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
  10. 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.
  11. A section for comments.
- 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 CxA 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 CxA will determine the sampling rate. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA 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. Time for CxA to direct any re-testing will be “back-charged” to the Contractor at a cost of \$3000.00 per man-day.
- I. Coordination and Scheduling: The Contractor shall provide a minimum of 7 days notice to the CxA and the VA regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Contractor, CxA and VA will coordinate the schedule for Systems Functional Performance Tests throughout the project construction. The Contractor shall allow sufficient time in the project schedule for the completion of the Functional Performance Tests based on the Functional Testing schedules and durations provided by the CxA at the commissioning “kick-off” meeting. The Functional Testing schedules and durations shall not be shortened or compressed without approval by the CxA and VA. Premium time (work outside normal work hours of 8AM-5PM, Monday thru Friday) for the CxA to complete testing due to shortened/compressed project schedule will be negotiated with the VA and “back-charged” to the Contractor at a rate of \$3000 per man-day if the delays are determined to be caused by the Contractor. The CxA 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 CxA 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 CxA will assist with problem resolution/”trouble-shooting” and recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

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

- A. Documentation: The CxA will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the CxA for that purpose. Prior to testing, the CxA will provide these forms to the VA and the Contractor for review and approval. The CxA will include the executed Systems Functional Performance Test forms in the Final Commissioning Report.
- B. Nonconformance: The CxA 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 Site Visit 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 CxA 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 CxA 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 CxA 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 site visit is complete, the CxA will submit a Commissioning Site Visit Report to the VA which will 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 CxA.
  - b. The need for retesting will be determined by the CxA. If retesting is required, the CxA 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 Site Visit 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. Once the interpretation and resolution have been decided, the Contractor shall correct the item of noncompliance, report it to the CxA. The requirement for retesting will be determined by the CxA. If retesting is required, the CxA 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. Time for the CxA to direct any retesting will be negotiated with the VA and "back-charged" to the Contractor at a rate of \$3000.00 per man-day if the retesting is determined to be caused 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 CxA 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 CxA and by the VA. The CxA 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 CxA and the Contractor.

### **3.6 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 and the CxA. Unforeseen Deferred Functional Performance Tests shall be conducted as soon as possible. Services of the Contractor to conduct Unforeseen Deferred Systems Functional Performance Tests shall be negotiated between the VA and the Contractor.

### **3.7 OPERATION AND MAINTENANCE TRAINING**

- A. Training Preparation Conference: Before operation and maintenance training, the Contractor will convene a training preparation conference to include VA's Resident Engineer, VA's Operations and Maintenance personnel, and the CxA (CxA may attend via conference call). The purpose of this conference will be to discuss and plan for Training and Demonstration of VA Operations and

Maintenance personnel. Contractor shall provide minutes from the training preparation conference and submit them to all of the conference attendees.

- B. The Contractor shall provide training and demonstration as required by other Division 01, Division 22, Division 23, and Division 26 sections. The CxA will monitor the completion of the Owner Training exercises by attending a sampling of the Owner Training sessions and reviewing the final executed Owner Training Plan and documentation submitted by the Contractor.

----- END -----

**SECTION 02 01 00**  
**GEOTECHNICAL DATA**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. General: A soils investigation report has been prepared for the site of this work by Terracon Consultants, Inc., 25809 I-30 South, Bryant, Arkansas 72022, Phone – (501) 847-9292, Fax – (501) 847-9210, hereinafter referred to as the Soil Engineer or Geotechnical Engineer.
- B. Availability: The soils investigation report has been included in this Section of the Specifications.
- C. Use of Data:
  - 1. This report was obtained only for the Architect's use in design and is not part of the Contract Documents. The report is available for bidder's information, but is not a warranty of subsurface conditions.
  - 2. Bidders shall visit the site and acquaint themselves with all existing conditions. Prior to bidding, bidders are advised to make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but all such investigations shall be performed only under time schedules and arrangements approved in advance by the Architect.
  - 3. Bidders shall acquaint themselves with the soils investigation pertaining to the types of soil conditions found at this site.

**1.2 DESCRIPTION**

- A. Test Boring Logs: The report will present physical data on subsurface conditions that is for the information of the Owner only, and in no event is this information to be considered as part of the Contract. It is expressly understood that the Owner or the Architect will not be responsible for any interpretation or conclusions drawn there from by the Contractor.
- B. Limitations of Subsurface Information Indicated on Drawings:
  - 1. Certain information regarding the reputed presence, size, character and location of existing underground structures, pipes and conduits has been indicated on the Drawings for the benefit of the Owner. There is no certainty of the accuracy of this information, and the location of underground structures indicated may be inaccurate and other obstructions than those indicated may be encountered.

2. The Contractor hereby distinctly agrees that neither the Owner nor the Architect is responsible for the correctness or sufficiency of the information given:
  - a. That in no event is this information to be considered as a part of the Contract;
  - b. That the General Contractor shall have no claim for delay or extra compensation or damage given; or on account of the insufficiency or absence of information regarding obstruction either revealed or not revealed by the Drawings; and
  - c. That the General Contractor shall have no claim for relief from any obligation or responsibility under the Contract, in case the location, size or character of any pipe or other underground structure is not as indicated on the Drawings, or in case any pipe or other underground structure is encountered that is not indicated on the Drawings.

**1.2 SUBSURFACE INVESTIGATION**

- A. Test borings were made at the site by: Terracon Consultants, Inc.
- B. Geotechnical report and boring logs will be included with the Report.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

- - - END - - -

## SECTION 02 41 13

### SELECTIVE SITE DEMOLITION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Selective demolition work, complete, as indicated, specified, and required for new work, including removal and disposal of demolished materials.
- B. Removal, protection, and storage of items designated to be reused.
- C. Removal, protection, and delivery of items designated as Owner's salvage to location as directed by Owner.

##### 1.2 RELATED WORK

- A. Not in this Phase

##### 1.3 SUBMITTALS: Comply with Section 01 33 00

- A. Before commencing selective demolition work, submit for review and approval of the Architect, a schedule showing the commencement, order, and completion dates for the various parts of this work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise protection.
- B. Before starting any work relating to existing utilities that will temporarily discontinue service to adjacent buildings, notify the Architect / Owner 72 hours in advance and obtain approval before proceeding with work. Do not disconnect or disrupt service without Architect's prior approval.

##### 1.4 PROJECT CONDITIONS:

- A. Condition of Structure: Owner assumes no responsibility for actual condition of items or portions of structures to be demolished.
- B. Salvageable Items:
  - 1. Salvage items indicated. Store at location as directed by Owner.
  - 2. Items indicated to be removed, and not designated for Owner's salvage or for reuse, may be salvaged by the Contractor. Transport salvaged items from site as they are removed. Storage or sale of removed items on site will not be permitted.
- C. Protections:
  - 1. Provide protective measures as required to protect personnel and general public from injury due to selective demolition work.



- 2. Provide adequate fire protection in accordance with local Fire Department requirements.
- D. Damages: Promptly repair, to the satisfaction of the Architect, damages caused to contents by demolition work or due to insufficiency of protection provided, at no cost to Owner. Replace damaged work, as directed by the Architect, if not satisfactory.
- E. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
- F. Explosives: Use of explosives will not be permitted.
- G. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practicable level. Comply with governing regulations pertaining to environmental protection.

## PART 2 - PRODUCTS

- A. Not Used

## PART 3 - EXECUTION

### 3.1 DEMOLITION

- A. Refer to drawings and provide selective demolition as indicated and as required for new work.
- B. Proceed in a systematic manner. Use such methods as required to complete work in accordance with demolition schedule and governing regulations.
- C. Demolish concrete in small sections. Cut concrete at junctures with construction to remain using power-driven masonry saw or hand tools: do not use power driven impact tools.

### 3.2 DISPOSAL OF DEMLOISHED MATERIAL

- A. Remove debris, rubbish, and other materials resulting from demolition operations as the work progresses. Transport and legally dispose of materials off site. Burning of debris will not be permitted on site.

### 3.3 CLEAN UP AND REPAIR

- A. Upon completion of selective demolition work, remove tools, equipment and demolished materials from site. Remove protections.
- B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

**SECTION 024119**  
**SELECTIVE DEMOLITION**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Demolition and removal of selected site elements.
  - 3. Salvage of existing items to be reused or recycled.

**1.2 RELATED WORK**

- A. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Disconnecting utility services prior to demolition: Section 010000, GENERAL REQUIREMENTS.
- C. Reserved items that are to remain the property of the Government: Section 010000, GENERAL REQUIREMENTS.
- D. Environmental Protection: Section 015719, TEMPORARY ENVIRONMENTAL CONTROLS.
- E. Infectious Control: Section 000501, SPECIAL REQUIREMENTS FOR WORK WITHIN A VA HOSPITAL.
- F. See Division 2, Section "SITE CLEARING" for site clearing and removal of above and below grade improvements.
- G. See Division 22 and 23 Sections for demolishing, cutting, patching or relocating mechanical items.
- H. See Division 26 Sections for demolishing, cutting, patching, or relocating electrical items.

**1.3 DEFINITIONS**

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

#### **1.4 MATERIALS OWNERSHIP**

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

#### **1.5 SUBMITTALS**

- A. Proposed Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate. Include measures for the following:
  - 1. Dust control.
  - 2. Noise control.
  - 3. Infection control
- B. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.
- C. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.
- D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

#### **1.6 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.7 QUALITY ASSURANCE**

- A. Green Globes™ Requirements
  - 1. Develop a Construction, Demolition and Renovation (C&D) Waste Management Plan into the project delivery process.
    - a. Describe how building materials will be reused or recycled.
    - b. Indicate responsibilities for implementation, timing and expected results.
    - c. Include a source separation workplan, and a plan for removing and properly disposing of hazardous products or materials.
- B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site.

## **1.8 PROJECT CONDITIONS**

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than seventy two (72) hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
  - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site will not be permitted.

- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

- 1. Maintain fire-protection facilities in service during selective demolition operations.

## **1.9 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. 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.
- E. 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.
- F. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center; any damaged items shall be repaired or replaced as approved by the Resident Engineer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded

and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have Resident Engineer's approval.

G. The work shall comply with the requirements of Section 015719, TEMPORARY ENVIRONMENTAL CONTROLS.

H. The work shall comply with the requirements of Section 010000, GENERAL REQUIREMENTS, Article 1.7 INFECTION PREVENTION MEASURES.

#### **1.10 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.

#### **1.11 WARRANTY**

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

### **PART 2 - PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

#### **2.2 REPAIR MATERIALS**

- A. Use repair materials identical to existing materials.
  - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  - 2. Use materials whose installed performance equals or surpasses that of existing materials.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

### **3.2 UTILITY SERVICES**

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
  - 1. Provide at least seventy two (72) hours' notice to Owner if shutdown of service is required during changeover.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
  - 2. If utility services are required to be removed, relocated, or abandoned, provide temporary utilities before proceeding with selective demolition that bypass area of selective demolition and that maintain continuity of service to other parts of building.
  - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- D. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

### **3.3 PREPARATION**

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and/or building manager and

authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
  3. Protect existing site improvements, appurtenances, and landscaping to remain.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- C. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
- D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- E. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

### **3.4 POLLUTION CONTROLS**

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
1. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

### **3.5 SELECTIVE DEMOLITION**

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations.



1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
  2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
  4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area designated by Owner.
  5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- F. Completely demolish and remove portions of 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.
- G. 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 property to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.
- H. In removing portions of buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.
- I. 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. 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.
- J. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Resident Engineer. When Utility lines are encountered that are not indicated on the drawings, the Resident Engineer shall be notified prior to further work in that area.

### **3.6 PATCHING AND REPAIRS**

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Division 1 Section "Cutting and Patching."
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.

- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
- F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

### **3.7 DISPOSAL OF DEMOLISHED MATERIALS**

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, promptly remove demolished materials from Project site.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

### **3.8 CLEANING**

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.
- B. On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to Resident Engineer. Clean-up shall include off the Medical Center Property 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 65 00**  
**UNDERGROUND STORAGE TANK REMOVAL**

**PART 1 – GENERAL**

**1.1 DESCRIPTION:**

- A. Underground Fuel Tank Liquid Removal:
  - 1. Material (Liquid) Testing.
  - 2. Removals and Disposal.
  - 3. Certification of Contents and Disposal.
- B. Underground Fuel Tank Cleaning and Disposal:
  - 1. Excavation of Tank.
  - 2. Removals and Disposal.
  - 3. Evacuation of Combustible Vapors.
  - 4. Tank Cleaning.
  - 5. Disassembling of Tank.
  - 6. Certification for Proper Disposal of Tank.
- C. Contamination Assessment:
  - 1. Soil Testing.
  - 2. Contaminated Soil Disposal
  - 3. Certification for Proper Disposal of Contaminated Soil.
- D. Report:
  - 1. Written report describing in detail the procedures used to remove the liquid from the underground storage tank, cleaning and removing of the underground storage tank, and disposal of the liquid residues.
  - 2. Photographic documentation of the work, including lab and field results, and receipts from the proper authority for the tank and residue disposal.

**1.2 RELATED WORK:**

- A. Section 01 45 29, TESTING LABORATORY SERVICES
- B. Section 02 41 00, DEMOLITION
- C. Section 31 20 00, EARTH MOVING
- D. Section 23 05 11, COMMON WORK RESULTS FOR HVAC

**1.3 SUSTAINABILITY CONSIDERATIONS:** This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

A. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**1.4 QUALITY ASSURANCE:**

- A. Underground fuel tank removal and disposal shall comply with the following:
1. United States Environmental Protection Agency (EPA), 40 CFR Part 280 and Part 281.
  2. United States Environmental Protection Agency (EPA), Test Methods for Petroleum Hydrocarbons, SW-846 Method 8015.
  3. State of Arkansas Department of Environmental Management Guidelines.
  4. OSHA Standards 29 CFR Part 1910 and 1926.1128.

**1.5 SUBMITTAL:**

- A. Furnished detailed CADD generated submittals including:
1. Detailed plan view
  2. Piping removal diagrams
  3. Control removal diagrams
  4. Component diagrams including tank removal procedure
  5. Detailed sequence of procedure
  6. Local Fire Marshal requirement
  7. Hazardous material plan for local VA management.

**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 Petroleum Institute (API):
- 1604-96(R2010) ..... Closure of Underground Petroleum Storage Tanks

- C. American Society of Testing Materials (ASTM):
  - E1739-95(R2010)..... Guide to Risk-Based Corrective Action (RBCA) Applied  
at Petroleum Release Sites
  - E1912-98(R2004)..... Guide for Accelerated Site Characterization for  
Confirmed or Suspected Petroleum Releases
  - E1943-98(2010) ..... Guide for Remediation of Ground water by Natural  
Attenuation at Petroleum Release Sites
- D. National Fire Protection Agency (NFPA):
  - 30-08..... Flammable and Liquid Combustible Code
  - 70B-10..... Recommended Practice for Electrical Equipment  
Maintenance
  - 326-10..... Standard for Safeguarding of Tanks and Containers for  
Entry, Cleaning, or Repair
  - 329-10..... Recommended Practice for Handling Release of  
Flammable Liquids and Gases

### **1.7 PROJECT SITE CONDITIONS:**

Do not close or obstruct streets, sidewalks or drives without permission and approval of the VA.

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

### **PART 3 - EXECUTION**

#### **3.1 GENERAL:**

- A. Remove underground storage tank, liquid, and associated work, including soil removal as specified and indicated on the drawings.
- B. Restore the excavated area with new materials as specified to match adjacent (existing) surfaces.

#### **3.2 UNDERGROUND STORAGE TANK LIQUID REMOVAL:**

- A. Provide samples of liquids from the underground fuel storage tank to a qualified state certified hazardous waste testing facility for laboratory analysis and approval for the liquid disposal and disposal location.
- B. Remove the liquid from the tank for disposal prior to removing the tank from the ground.
- C. Provide documentation of the liquid removal and its disposal in a final report to the VA.

#### **3.3 UNDERGROUND STORAGE TANK CLEANING AND DISPOSAL:**

- A. Tank shall be reviewed and certified clean by local Fire Marshal.

- B. Remove the tank from the ground, place it on the ground adjacent to removal location, and secure it prior to cleaning.
- C. Measure levels of combustible vapors and oxygen, and initiate ventilation of the tank, if needed:
  - 1. Ventilate tank using a small gas exhauster until the vapor concentration is reduced to 10 percent or less of the lower explosive limit.
  - 2. Oxygen content shall range from 19.5 to 23.5 percent.
  - 3. Cut access ports for cleaning into tank after vapor and oxygen concentrations have met the requirements noted above.
- D. Cleaning of the tank shall include mopping, scraping, and sweeping the interior of the tank.
- E. Collect, contain and place residuals in a United States Department of Transportation (DOT) approved type 17H, 200 L (55 gallon) capacity drum, for transporting and disposal.
- F. Ensure final vapor and oxygen concentration are within the requirements noted above before proceeding to cut and dismantle the tank for its disposal.
- G. Remove dismantled tank to an approved disposal facility.
- H. Obtain disposal facility receipts noting proper tank disposal.

#### **3.4 REMOVED TANK AREA ASSESSMENT:**

- A. Collect five soil samples from the removed underground storage tank area. Take one sample from each of the sidewalls, and one sample from the base. Containerize the samples in glass sample jar(s), seal with Teflon-coated lids, and place the jar on ice. Deliver samples with completed chain-of-custody documentation to the laboratory. Laboratory shall analyze each sample for Total Petroleum Hydrocarbon (TPH) concentrations using a modified EPA method 8015.
- B. Site Restoration: See Section 31 20 00, EARTH MOVING.

### **3.5 CONTAMINATED SOIL:**

- A. When soil assessments reveal evidence of leakage or spillage of hydrocarbons at levels above those established by the state department of environmental management for underground storage tank closures (100 parts per million), collect additional soil samples beyond the boundaries of the original tank location (Tank boundary is defined as tank enclosure in a right angle that touches the circumference of the tank). Any volume difference between the tank and the enclosure shall not to exceed 100 cubic yards of soil removed. Any work beyond this boundary shall be considered extra and shall be based on unit pricing.
- B. Continue the soil contamination assessment testing around the tank until the contamination level is within acceptable level, less than 100 parts per million.
- C. Remove all contaminated soil from the site and haul it to an approved sanitary landfill for proper disposal.

### **3.6 COMMISSIONING**

- A. Provide commissioning documentation in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS for all inspection, start up, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.
- B. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS and related sections for contractor responsibilities for system commissioning.

- - - 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 roads, 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. Accompany request for approval of testing agency with a copy of Report of Latest Inspection of Laboratory Facilities by CCRL.
- C. Testing agency shall furnish equipment and qualified technicians to establish proportions of ingredients for concrete mixes.

**1.4 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. Air-entraining admixture.
  3. Chemical admixtures, including chloride ion content.
  4. Waterproof paper for curing concrete.
  5. Liquid membrane-forming compounds for curing concrete.
  6. Non-shrinking grout.
  7. Liquid hardener.
  8. Waterstops.
  9. Expansion joint filler.
- 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 and copy of report of latest CCRL, Inspection of Laboratory.
- F. Test Report for Concrete Mix Designs: Trial mixes including water-cement fly ash ratio curves, concrete mix ingredients, and admixtures.

## **1.7 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

- B. Heat Islands: All site concrete paving, including walkways and parking, shall use light-colored, high-albedo materials with at least 30% reflectance values. Documentation of reflectance and emittance (Solar Reflectivity Index [SRI]) values shall be provided in contractor's submittals.

## **1.8 DELIVERY, STORAGE, AND HANDLING:**

- A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.
- B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least 300 mm (1 foot) above ground. Store bulk cement and fly ash in separate suitable bins.
- C. Deliver other packaged materials for use in concrete in original sealed containers, plainly marked with manufacturer's name and brand, and protect from damage until used.

## **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 Concrete Institute (ACI):

117-10 .....Tolerances for Concrete Construction and Materials

211.1-91(R2009).....Selecting Proportions for Normal, Heavyweight, and Mass  
Concrete

214R-02 .....Evaluation of Strength Test Results of Concrete

301-10 .....Structural Concrete

304R-00(R2009).....Guide for Measuring, Mixing, Transporting, and Placing  
Concrete

305R-10 .....Hot Weather Concreting

- 306R-10 ..... Cold Weather Concreting
- 308R-01(R2008) ..... Standard Practice for Curing Concrete
- 309R-05 ..... Guide for Consolidation of Concrete
- 318-08 ..... Building Code Requirements for Reinforced Concrete and  
Commentary
- 347-04 ..... Guide to Formwork for Concrete
- SP-66-04 ..... ACI Detailing Manual
- C. 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-09 ..... Deformed and Plain Billet-Steel Bars for Concrete  
Reinforcement
- A653/A653M-09 ..... Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-  
Coated (Galvannealed) by the Hot-Dip Process
- A706/A706M-09 ..... Low-Alloy Steel Deformed and Plain Bars for Concrete  
Reinforcement
- A820-06 ..... Steel Fibers for Fiber-Reinforced Concrete
- C31/C31M-09 ..... Making and Curing Concrete Test Specimens in the field
- C33-08 ..... Concrete Aggregates
- C39/C39M-09 ..... Compressive Strength of Cylindrical Concrete Specimens
- C94/C94M-09 ..... Ready-Mixed Concrete
- C143/C143M-10 ..... Slump of Hydraulic Cement Concrete
- C150-09 ..... Portland Cement
- C171-07 ..... Sheet Materials for Curing Concrete
- C172-08 ..... Sampling Freshly Mixed Concrete
- C173-10... ..... Air Content of Freshly Mixed Concrete by the Volumetric  
Method
- C192/C192M-07 ..... Making and Curing Concrete Test Specimens in the Laboratory
- C231-09 ..... 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
- C330-09 ..... Lightweight Aggregates for Structural Concrete
- C494/C494M-10 ..... Chemical Admixtures for 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
- C881/C881M-02 ..... Epoxy-Resin-Base Bonding Systems for Concrete
- C1107/1107M-08 ..... Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
- C1315-08 ..... Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete
- D6-95(R2006) ..... Loss on Heating of Oil and Asphaltic Compounds
- D297-93(R2006) ..... Rubber Products-Chemical Analysis
- D1751-04(R2008) ..... Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
- D4397-09 ..... Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
- E1155-96(R2008) ..... Determining  $F_F$  Floor Flatness and  $F_L$  Floor Levelness Numbers
- D. American Welding Society (AWS):
- D1.4/D1.4M-11 ..... Structural Welding Code - Reinforcing Steel
- E. Concrete Reinforcing Steel Institute (CRSI):
- Handbook 2008
- F. National Cooperative Highway Research Program (NCHRP):
- Report On..... Concrete Sealers for the Protection of Bridge Structures
- G. U. S. Department of Commerce Product Standard (PS):
- PS 1 ..... Construction and Industrial Plywood
- PS 20 ..... American Softwood Lumber
- H. U. S. Army Corps of Engineers Handbook for Concrete and Cement:
- CRD C513..... Rubber Waterstops
- CRD C572..... Polyvinyl Chloride Waterstops

## **PART 2 – PRODUCTS:**

### **2.1 FORMS:**

- A. Wood: PS 20 free from loose knots and suitable to facilitate finishing concrete surface specified; tongue and grooved.
- B. Plywood: PS-1 Exterior Grade B-B (concrete-form) 16 mm (5/8 inch), or 20 mm (3/4 inch) thick for unlined contact form. B-B High Density Concrete Form Overlay optional.

- C. Permanent Steel Form for Concrete Slabs: Corrugated, ASTM A653, Grade E, and Galvanized, ASTM A653, G90. Provide venting where insulating concrete fill is used.
- D. 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 alkalis, and loss on ignition (LOI) not to exceed 5 percent.
- C. Coarse Aggregate: ASTM C33.
  - 1. Size 67 or Size 467 may be used for footings and walls over 300 mm (12 inches) thick.
  - 2. 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. Mixing Water: Fresh, clean, and potable.
- E. 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, deformed, grade as shown.
- J. Welded Wire Fabric: ASTM A185.
- K. Reinforcing Bars to be Welded: ASTM A706.
- L. Cold Drawn Steel Wire: ASTM A82.
- M. Reinforcement for Metal Pan Stair Fill: 50 mm (2 inch) wire mesh, either hexagonal mesh at  $.8\text{Kg/m}^2$  (1.5 pounds per square yard), or square mesh at  $.6\text{Kg/m}^2$  (1.17 pounds per square yard).
- N. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.
- O. Expansion Joint Filler: ASTM D1751.
- P. Sheet Materials for Curing Concrete: ASTM C171.
- Q. 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.
- R. Abrasive Aggregate: Aluminum oxide grains or emery grits.
- S. Moisture Vapor Emissions & Alkalinity Control Sealer: 100% active colorless aqueous siliconate 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 .
1. ASTM C1315 Type 1 Class A, and ASTM C309 Type 1 Class A, penetrating product to have no less than 34% solid content, leaving no sheen, volatile organic compound (VOC) content rating as required to suite regulatory requirements. The product shall have at least a five (5) year documented history in controlling moisture vapor emission from damaging floor covering, compatible with all finish materials.
  2. MVE 15-Year Warranty:
    - a. When a floor covering is installed on a below grade, on grade, or above grade concrete slab treated with Moisture Vapor Emissions & Alkalinity Control Sealer according to manufacturer's instruction, sealer manufacturer shall warrant the floor covering system against failure due to moisture vapor migration or moisture-born contaminates for a

period of fifteen (15) years from the date of original installation. The warranty shall cover all labor and materials needed to replace all floor covering that fails due to moisture vapor emission & moisture born contaminants.

T. Non-Shrink Grout:

1. ASTM C1107, pre-mixed, produce a compressive strength of at least 18 MPa at three days and 35 MPa (5000 psi) at 28 days. Furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 1200 mm x 1200 mm (4 foot by 4 foot) base plate.
2. Where high fluidity or increased placing time is required, furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent under an 450 mm x 900 mm (18 inch by 36 inch) base plate.

U. 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).
5. Synthetic Fibers: Monofilament or fibrillated polypropylene fibers for secondary reinforcing of concrete members. Use appropriate length and 0.9 kg/m<sup>3</sup> (1.5 lb. per cubic yard). Product shall have a UL rating.
6. Steel Fibers: ASTM A820, Type I cold drawn, high tensile steel wire for use as primary reinforcing in slab-on-grade. Minimum dosage rate 18 kg/m<sup>3</sup> (30 lb. per cubic yard).
7. Epoxy Joint Filler: Two component, 100 percent solids compound, with a minimum shore D hardness of 50.
8. Bonding Admixture: Non-re-wettable, polymer modified, bonding compound.

## **2.3 CONCRETE MIXES:**

A. Mix Designs: Proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.

1. If trial mixes are used, make a set of at least 6 cylinders in accordance with ASTM C192 for test purposes from each trial mix; test three for compressive strength at 7 days and three at 28 days.
2. Submit a report of results of each test series, include a detailed listing of the proportions of trial mix or mixes, including cement, fly ash, admixtures, weight of fine and coarse aggregate



- per m<sup>3</sup> (cubic yard) measured dry rodded and damp loose, specific gravity, fineness modulus, percentage of moisture, air content, water-cement -fly ash ratio, and consistency of each cylinder in terms of slump.
3. Prepare a curve showing relationship between water-cement -fly ash ratio at 7-day and 28-day compressive strengths. Plot each curve using at least three specimens.
  4. If the field experience method is used, submit complete standard deviation analysis.
- B. Fly Ash Testing: Submit certificate verifying conformance with specifications initially with mix design and for each truck load of fly ash delivered from source. Notify Resident Engineer immediately when change in source is anticipated. Prior to beginning trial mixes submit to the Resident Engineer the following representative samples of material to be used, properly identified source and project description and number, type of testing (complete chemical and physical), suitably packaged for shipment, and addressed as specified. Allow 60 calendar days for test results after submittal of sample.
1. Fly ash - 2.25 kg (five pounds).
  2. Portland cement - 3.5 kg (8 pounds):
    - a. Address -Waterways Experiment Station (WES)
    - b. 3909 Halls Ferry Road
    - c. Vicksburg, MS 39180-6199
    - d. ATTN: Engineering Materials Group
- C. After approval of mixes no substitution in material or change in proportions of approval mixes may be made without additional tests and approval of Resident Engineer or as specified. Making and testing of preliminary test cylinders may be carried on pending approval of cement and fly ash , providing Contractor and manufacturer certify that ingredients used in making test cylinders are the same. Resident Engineer may allow Contractor to proceed with depositing concrete for certain portions of work, pending final approval of cement and fly ash and approval of design mix.
- D. Cement Factor: Maintain minimum cement factors in Table I regardless of compressive strength developed above minimums. Use Fly Ash as an admixture with 20% replacement by weight in all structural work and reduce it to 10% for drilled piers and caissons.

**TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE**

| Concrete Strength      |   | Non-Air-Entrained       | Air-Entrained                         |                         |
|------------------------|---|-------------------------|---------------------------------------|-------------------------|
| Min. 28 Day Comp. Str. | Min. Cement kg/m <sup>3</sup> (lbs/c. yd) | Max. Water Cement Ratio | Min. Cement kg/m <sup>3</sup> (lbs/c. | Max. Water Cement Ratio |

| MPa (psi)                |           |      | yd        |      |
|--------------------------|-----------|------|-----------|------|
| 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.
  2. Lightweight Structural Concrete. Pump mixes may require higher cement values.
  3. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.
  4. Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.
- E. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II.

**TABLE II - MAXIMUM SLUMP, MM (INCHES)\***

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

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

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

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

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

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

- H. Concrete slabs placed at air temperatures below 10 degrees C (50 degrees Fahrenheit) use non-corrosive, non-chloride accelerator. Concrete required to be air entrained use approved air entraining admixture. Pumped concrete, synthetic fiber concrete, architectural concrete, concrete required to be watertight, and concrete with a water/cement ratio below 0.50 use high-range water-reducing admixture (superplasticizer).
- I. 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.
- J. 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<sup>0</sup>C (100 degrees Fahrenheit). Minimum delivery temperature as follows:

| Atmospheric Temperature   | Minimum Concrete Temperature   |
|---|--------------------------------|
| -1. degrees to 4.4 degrees C<br>(30 degrees to 40 degrees F)    | 15.6 degrees C (60 degrees F.) |
| -17 degrees C to -1.1 degrees C (0<br>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.
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.
- 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. 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.
- G. 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. 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.
2. Do not install sleeves in columns except where shown or permitted by Resident Engineer.
3. 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.
4. Provide recesses and blockouts in floor slabs for door closers and other hardware as necessary in accordance with manufacturer's instructions.

H. Construction Tolerances:

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

**3.2 PLACING REINFORCEMENT:**

A. General: Details of concrete reinforcement in accordance with ACI 318 unless otherwise shown.

B. Placing: Place reinforcement conforming to CRSI DA4, unless otherwise shown.

1. Place reinforcing bars accurately and tie securely at intersections and splices with 1.6 mm (16 gauge) black annealed wire. Secure reinforcing bars against displacement during the placing of concrete by spacers, chairs, or other similar supports. Portions of supports, spacers, and chairs in contact with formwork shall be made of plastic in areas that will be exposed when building is occupied. Type, number, and spacing of supports conform to ACI 318. Where concrete slabs are placed on ground, use concrete blocks or other non-corrodible material of proper height, for support of reinforcement. Use of brick or stone supports will not be permitted.
2. Lap welded wire fabric at least 1 1/2 mesh panels plus end extension of wires not less than 300 mm (12 inches) in structural slabs. Lap welded wire fabric at least 1/2 mesh panels plus end extension of wires not less than 150 mm (6 inches) in slabs on grade.

- 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 laps 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 under 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 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.
- C. 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 pre-molded filler and placing adjacent concrete.

### **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.
- 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. 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  $10\text{m}^2/\text{L}$  (400 square feet per gallon) on steel troweled surfaces and  $7.5\text{m}^2/\text{L}$  (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. 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.
- B. Control Test: Use to determine if the concrete has attained sufficient strength and curing to permit removal of supporting forms. Cylinders required for control tests taken in accordance with ASTM C172, molded in accordance with ASTM C31, and tested in accordance with ASTM C39. Control cylinders cured and protected in the same manner as the structure they represent. Exercise care to assure that newly unsupported portions of structure are not subjected to heavy construction or material loading.

### **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 Surface Finishes:**

- 1. Unfinished areas: Vertical 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.

#### **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. 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. 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.
8. 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.
9. 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.
10. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:
  - a. Areas covered with carpeting, or not specified otherwise in b. below:
    - 1) Slab on Grade:
      - a) Specified overall value  $F_F 25/F_L 20$

- b) Minimum local value F<sub>F</sub> 17/F<sub>L</sub> 15
    - 2) Unshored suspended slabs:
      - a) Specified overall value FF 25
      - b) Minimum local value FF 17
    - 3) Level tolerance such that 80 percent of all points fall within a 20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch) from the design elevation.
  - b. Areas that will be exposed, receive thin-set tile or resilient flooring, or roof areas designed as future floors:
    - 1) Slab on grade:
      - a) Specified overall value FF 36/FL 20
      - b) Minimum local value FF 24/FL 15
    - 2) Unshored suspended slabs:
      - a) Specified overall value FF 30
      - b) Minimum local value FF 24
    - 3) Level tolerance such that 80 percent of all points fall within a 20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch) from the design elevation.
  - c. "Specified overall value" is based on the composite of all measured values in a placement derived in accordance with ASTM E1155.
  - d. "Minimum local value" (MLV) describes the flatness or levelness below which repair or replacement is required. MLV is based on the results of an individual placement and applies to a minimum local area. Minimum local area boundaries may not cross a construction joint or expansion joint. A minimum local area will be bounded by construction and/or control joints, or by column lines and/or half-column lines, whichever is smaller.
- 12. Measurements
  - a. Department of Veterans Affairs retained testing laboratory will take measurements as directed by Resident Engineer, to verify compliance with FF, FL, and other finish requirements. Measurements will occur within 72 hours after completion of concrete placement (weekends and holidays excluded). Make measurements before shores or forms are removed to insure the "as-built" levelness is accurately assessed. Profile data for above characteristics may be collected using a laser level or any Type II apparatus (ASTM E1155, "profileograph" or "dipstick"). Contractor's surveyor shall establish reference elevations to be used by Department of Veterans Affairs retained testing laboratory.

- b. Contractor not experienced in using FF and FL criteria is encouraged to retain the services of a floor consultant to assist with recommendations concerning adjustments to slab thicknesses, finishing techniques, and procedures on measurements of the finish as it progresses in order to achieve the specific flatness and levelness numbers.
- 13. Acceptance/ Rejection:
  - a. If individual slab section measures less than either of specified minimum local  $F_F/F_L$  numbers, that section shall be rejected and remedial measures shall be required. Sectional boundaries may be set at construction and contraction (control) joints, and not smaller than one-half bay.
  - b. If composite value of entire slab installation, combination of all local results, measures less than either of specified overall  $F_F/F_L$  numbers, then whole slab shall be rejected and remedial measures shall be required.
- 14. Remedial Measures for Rejected Slabs: Correct rejected slab areas by grinding, planing, surface repair with underlayment compound or repair topping, retopping, or removal and replacement of entire rejected slab areas, as directed by Resident Engineer, until a slab finish constructed within specified tolerances is accepted.

### **3.14 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 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.

### **3.16 PRECAST CONCRETE ITEMS:**

Precast concrete items, not specified elsewhere. Cast using 25 MPa (3000 psi) air-entrained concrete to shapes and dimensions shown. Finish to match corresponding adjacent concrete surfaces. Reinforce with steel for safe handling and erection.

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**SECTION 03 45 00**  
**PRECAST ARCHITECTURAL CONCRETE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section includes the performance criteria, materials, production, and erection of architectural precast concrete cladding units. The work performed under this section includes all labor, material, equipment, related services, and supervision required for the manufacture and erection of the architectural precast concrete work shown on the contract drawings.

**1.2 RELATED WORK**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- C. Mortar: Section 04 05 13, MASONRY MORTARING; Section 04 05 16, MASONRY GROUTING.
- D. Masonry Facing: Section 04 20 00, UNIT MASONRY.
- E. Insulation for Insulated Panels: Section 07 21 13, THERMAL INSULATION.
- F. Sealants and Caulking: Section 07 92 00, JOINT SEALANTS.
- G. Size, type and color of aggregate for exposed aggregate finish and matrix color: Section 09 06 00, SCHEDULE FOR FINISHES.
- H. Ceramic Tile Facing: Section 09 30 13, CERAMIC TILING.
- I. Repair of abraded galvanized and painted surfaces: Section 09 91 00, PAINTING.

**1.3 QUALITY ASSURANCE**

- A. Fabricator Qualifications: A firm that complies with PCI MNL 117 and the following requirements and is experienced in producing units similar to those indicated for this Project and with a record of successful in-service performance:
  - 1. Assumes responsibility for engineering units to comply with performance requirements. A Comprehensive Engineering Analysis shall be performed by a qualified professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
  - 2. Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-certified plant for Group A, Category A1- Architectural Cladding and Load Bearing Units.
  - 3. Has sufficient production capacity to produce required units without delaying the work.

B. Erector Qualifications:

1. A precast concrete erector Qualified by the Precast/Prestressed Concrete Institute (PCI) prior to beginning work at the project site. Submit a current Certificate of Compliance furnished by PCI designating qualification in Category A (Architectural Systems) for non-load-bearing members.
2. An erector with a minimum of 2 years of experience who has completed architectural precast concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
3. The Erector shall unload, store, protect, and install as specified, and shall provide and install all anchors and accessories.

C. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel"; and AWS D1.4/D1.4M, "Structural Welding Code – Reinforcing Steel".

E. Sample Panels: After sample approval and before fabricating units, produce a minimum of two sample panels approximately 1.5 sq. m. (16 sq. ft.) in size for review by Resident Engineer. Incorporate full scale details of architectural features, finishes, textures, and transitions in the sample panels. Approved sample panel may be used for mockup and range sample.

1. Locate panels where indicated or, if not indicated, as directed by Resident Engineer.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After acceptance of repair technique, maintain one sample panel at the manufacturer's plant and one at the project site in an undisturbed condition as a standard for judging the completed work.
4. When back face of precast concrete unit is to be exposed, show samples of the workmanship, color, and texture of the backup concrete as well as the facing.
5. Demolish and remove sample panels only when directed.

F. Range Samples: After sample panel approval and before production of units, produce a minimum of three samples, approximately 1.5 sq. m. (16 sq. ft.) in size, representing anticipated range of color and texture on project's units. Following range sample acceptance by the Resident Engineer, maintain samples at the manufacturer's plant as color and texture acceptability reference.

G. Mockups: After sample approval but before production of units, construct full sized mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Mockup to be representative of the finished work in all respects including glass, aluminum framing, sealants and architectural precast concrete complete with all anchors,

connections, flashings, and joint fillers as accepted on the final shop drawings. Build mockups to comply with the following requirements, using materials indicated for the completed work:

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Resident Engineer.
2. Notify Resident Engineer in advance of dates and times when mockups will be constructed.
3. Obtain Resident Engineer's approval of mockups before starting fabrication.
4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
5. Demolish and remove mockups when directed.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01, GENERAL REQUIREMENTS.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide units and connections capable of withstanding: the design criteria specified on the drawings, self weights and weights of materials supported or attached, for the conditions indicated.
1. Design Standards: Comply with ACI 318 (ACI 318M) and the design recommendations of PCI MNL 120, applicable to types of units indicated.
  2. Limit deflection of precast members as follows:  
Vertical live load –  $\text{Span} / 360$ .  
Wind load – Floor to floor height times 0.0025.
  3. Design for handling, transportation and erection stresses.
- B. Design framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live load deflection, shrinkage and creep of primary building structure, and other building movements.
- C. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 27 deg C (80 deg F). Use other values, greater or smaller, whenever justified by climatic conditions at the project site.
- D. Calculated Fire-Test-Response Characteristics: Where indicated, provide units whose fire resistance has been calculated according to PCI MNL 124, and is acceptable to authorities having jurisdiction.

#### **1.5 SUBMITTALS**

- A. Product Data: For each type of product indicated. Retain quality control records and certificates of compliance for 5 years or period of warranty, whichever is greater.
- C. Design Mixes: For each concrete mix along with compressive strength and water-absorption tests.
- D. Shop (Erection) Drawings: Detail fabrication and installation of units.

1. Indicate member locations with distinctive marks that match marks placed on the panels. Provide plans, elevations, dimensions, corner details, shapes, cross sections and relationships to adjacent materials.
  2. Indicate aesthetic intent including joints, reveals, drips, chamfers, and extent and location of each surface finish.
  3. Indicate separate face and backup mix locations, and thicknesses. Indicate locations, extent and treatment of dry joints if two-stage casting is proposed.
  4. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, and connections.
  5. Indicate locations, tolerances and details of anchorage devices to be embedded in or attached to structure or other construction.
  6. Indicate sequence of erection.
  7. Indicate locations and details of facing materials, anchors, and joint widths.
  8. Design Modifications:  
If design modifications are necessary to meet the performance requirements and field conditions, submit design calculations and drawings. Do not adversely affect the appearance, durability or strength of units when modifying details or materials and maintain the general design concept.
- E. Comprehensive Engineering Analysis: Provide calculations signed, sealed and certified by the qualified professional engineer responsible for the product design. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate design criteria and loads. Indicate the location, type, magnitude and direction of all imposed loadings from the precast system to the building structural frame.
- F. Samples: Design reference samples for initial verification of design intent, approximately 300 by 300 by 50 mm (12 by 12 by 2 inches), representative of each type of finish, color, and texture of exposed surfaces of units.
- G. Samples for each facing unit required, showing the full range of color and texture expected. Supply sketch of each corner or special shape with dimensions. Supply sample showing color and texture of joint treatment.
- H. Delegated-Design Submittal: For Architectural Pre-Cast Concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the Qualified Professional Engineer responsible for their preparation.
- I. Welding Certificates: Copies of certificates for welding procedure specifications (WPS) and personnel.

- J. Qualification Data for fabricator and professional engineer: List of completed projects with project names and addresses, names and addresses of Resident Engineers and owners, and other information specified.
- K. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
  - 1. Concrete strengths and mix designs.
  - 2. For aggregates.
- L. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements.
  - 1. Concrete materials.
  - 2. Reinforcing materials and prestressing tendons.
  - 3. Admixtures.
  - 4. Bearing pads.
  - 5. Structural-steel shapes and hollow structural sections.
  - 6. Insulation
  - 7. Facing units.
  - 8. Anchors.

#### **1.6 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.7 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Product handling requirements of PCI MNL 117 shall be followed at the plant and project site.
- B. Deliver all units to the project site in such quantities and at such times to assure compliance with the agreed project schedule and proper setting sequence so as to limit unloading units temporarily on the ground. Store units at project site to prevent cracking, distortion, warping, staining, or other physical damage and so that markings are visible.

- C. Lift and support units only at designated points shown on the Shop Drawings.
- D. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

## **1.8 WARRANTY**

- A. Warranty of precast concrete work, including anchorage, joint treatment and related components to be free from defects in materials and workmanship, including cracking and spalling.
- B. After erection, completed work will be weathertight, subject to terms of Article “Warranty of Construction” FAR clause 52.246-21, except warranty period is extended to five years.

## **1.9 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):
  - A27/A27M-03 ..... Steel Castings, Carbon, for General Application
  - A36/A36M-04 ..... Carbon Structural Steel
  - A47/A47M-99 ..... Ferritic Malleable Iron Castings
  - A82-02..... Steel Wire, Plain, for Concrete Reinforcement
  - A108-03..... Steel Bar, Carbon and Alloy, Cold-Finished
  - A123/A123M-02 ..... Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - A153/A153M-03 ..... Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  - A167-99..... Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
  - A184/A184M-01 ..... Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
  - A185-02..... Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
  - A276-04..... Stainless Steel Bars and Shapes
  - A283/A283M-03 ..... Low and Intermediate Tensile Strength Carbon Steel Plates
  - A307-03..... Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
  - A325/A325M-04 ..... Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  - A490/A490M-04 ..... Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
  - A496-02..... Steel Wire, Deformed, for Concrete Reinforcement
  - A497-02..... Steel Welded Wire Reinforcement, Deformed, for Concrete

- A500-03a ..... Cold-Formed Welded and Seamless Carbon Steel Structural Tubing  
in Rounds and Shapes
- A563/A563M-04 ..... Carbon and Alloy Steel Nuts
- A572/A572M-04 ..... High-Strength Low-Alloy Columbium-Vanadium Structural Steel
- A615/A615M-04a ..... Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- A666-03 ..... Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip,  
Plate, and Flat Bar
- A675/A675M-03 ..... Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical  
Properties
- A706/A706M-04a ..... Low-Alloy Steel Deformed and Plain Bars for Concrete  
Reinforcement
- A767/A767M-00b ..... Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
- A780-01 ..... Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized  
Coatings
- B633-98e1 ..... Electrodeposited Coatings of Zinc on Iron and Steel
- C33-03 ..... Concrete Aggregates
- C150-04 ..... Portland Cement
- C260-01 ..... Air-Entraining Admixtures for Concrete
- C330-04 ..... Lightweight Aggregates for Structural Concrete
- C494/C494M-01 ..... Chemical Admixtures for Concrete
- C979-99 ..... Pigments for Integrally Colored Concrete
- C1218/C1218M-99 ..... Test Method for Water-Soluble Chloride in Mortar and Concrete
- F436/F436M-03 ..... Hardened Steel Washers
- F568M-02 ..... Carbon and Alloy Steel Externally Threaded Metric Fasteners
- F593-02(04)e1 ..... Stainless Steel Bolts, Hex Cap Screws, and Studs
- F844-00 ..... Washers, Steel, Plain (Flat), Unhardened for General Use
- C. American Concrete Institute (ACI):
- ACI 211.1-91 ..... Selecting Proportions for Normal, Heavyweight and Mass Concrete  
(Reapproved 2002)
- D. Precast/Prestressed Concrete Institute (PCI):
- MNL-117-96 ..... Quality Control for Plants and Production of Architectural Precast  
Concrete Products
- MNL-120-99 ..... Design Handbook – Precast and Prestressed Concrete
- MNL-124-89 ..... Design for Fire Resistance of Precast Prestressed Concrete.

- MNL-127-99 .....Erector's Manual - Standards and Guidelines for the Erection of  
Precast Concrete Products
- MNL-135-00 .....Tolerance Manual for Precast and Prestressed Concrete  
Construction
- E. Structural Steel Painting Council (SSPC):
- SSPC-Paint 20 (2002) .....Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic).

## **PART 2 - PRODUCTS**

### **2.1 MOLD MATERIALS**

- A. Molds: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; non-reactive with concrete and suitable for producing required finishes:
1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

### **2.2 REINFORCING MATERIALS**

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (Grade 420), deformed.
- B. Weldable Reinforcing Bars: ASTM A706/A706M, deformed.
1. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized and chromate wash treated after fabrication and bending.
  2. Steel Bar Mats: ASTM A184/A184M, assembled with clips.
    - a. Plain-Steel Welded Wire Reinforcement: ASTM A185, fabricated from galvanized and chromate wash treated steel wire into flat sheets.
    - b. Deformed-Steel Welded Wire Reinforcement: ASTM A497, flat sheet.
- C. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117 where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class) or stainless steel protected (CRSI, Class 2).

### **2.3 CONCRETE MATERIALS**

- A. Portland Cement: ASTM C150, Type I or III.
1. For surfaces exposed to view in finished structure, use gray or white (as required to achieve proper color as determined by the Resident Engineer), same type, brand, and mill source throughout the precast concrete production.



- B. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C33, with coarse aggregates complying with Class 5S. Provide and stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for entire project.
  - 1. Face-Mix Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
    - a. Gradation: To match design reference sample.
    - b. Hard durable aggregate carefully graded from coarse to fine in proportions required to match approved samples.
    - c. Eliminate off color material from exposed aggregate.
  - 2. Face-Mixture Fine Aggregates: Selected, natural or manufactured sand of the same material as coarse aggregate, unless otherwise approved by Resident Engineer.
    - a. Test sand for color value in accordance with ASTM C40. Sand producing darker than specified color standard is unacceptable.
    - b. Clean washed white sand.
- D. Admixtures: Admixtures containing calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture are not permitted.
  - 1. Coloring Admixture: ASTM C979, synthetic or natural inorganic mineral-oxide pigments or colored water-reducing admixtures, temperature stable and non-fading and resistant to lime and other alkalis. Pigments not to exceed 10% of the cement weight.
  - 2. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
  - 3. Water-Reducing Admixture: ASTM C494/C494M, Type A.
  - 4. Retarding Admixture: ASTM C494/C494M, Type B.
  - 5. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
- E. Water: Potable; free from deleterious material that may affect cast-in steel color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

## **2.4 STEEL CONNECTION MATERIALS**

- A. Carbon-Steel Shapes and Plates: ASTM A36/A36M except silicon (Si) content in the range of 0 to 0.03% or 0.15 to 0.25% for materials to be galvanized. Steel with chemistry conforming to the formula  $Si + 2.5P \leq 0.09$  is also acceptable.
- B. Carbon-Steel Headed Studs: ASTM A108, Grades 1018 through 1020, cold finished and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.; AWS D1.1, Type A or B, with arc shields.
- C. Carbon-Steel Plate: ASTM A283/A283M.

- D. Carbon-Steel Castings: ASTM A27/A27M, Grade U-60-30 (Grade 415-205).
- E. High-Strength, Low-Alloy Structural Steel: ASTM A572/A572M except silicon (Si) content in the range of 0 to 0.03% or 0.15 to 0.25% for materials to be galvanized. Steel with chemistry conforming to the formula  $Si + 2.5P \leq 0.09$  is also acceptable.
- F. Carbon-Steel Structural Tubing: ASTM A500, Grade B.
- G. Wrought Carbon-Steel Bars: ASTM A675/A675M, Grade 65 (Grade 450).
- H. Deformed-Steel Wire or Bar Anchors: ASTM A496 or ASTM A706/A706M.
- I. Carbon-Steel Bolts and Studs: ASTM A307, Grade A (ASTM F568M, Property Class 4.6) carbon-steel, hex-head bolts and studs; carbon-steel nuts (ASTM A563/A563M, Grade A); and flat, unhardened steel washers (ASTM F844).
- J. High-Strength Bolts and Nuts: ASTM A325/A325M or ASTM A490/A490M, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, (ASTM A563/A563M) and hardened carbon-steel washers (ASTM F436/F436M).
- K. Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123/A123M, after fabrication, or ASTM A153/A153M, as applicable, or by electrodeposition according to ASTM B633, SC 3, Type 1.
  - 1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC-Paint 20.
- L. Welding Electrodes: Comply with AWS standards.

## **2.5 STAINLESS-STEEL CONNECTION MATERIALS**

- A. Stainless-Steel Plate: ASTM A666, Type 304, of grade suitable for application.
- B. Stainless-Steel Bolts and Studs: ASTM F593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless steel washers. Lubricate threaded parts of stainless steel bolts with an anti-seize thread lubricant during assembly.
- C. Stainless-Steel Headed Studs: ASTM A276 and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.

## **2.6 ACCESSORIES**

- A. Reglets: Stainless steel, ASTM A167, Type 302 felt or fiber filled or cover face opening of slots.
- B. Vents and Weeps: Polyvinyl chloride plastic tubing, 4.7 mm (3/16-inch) // inside diameter.
- C. Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install units.

## **2.7 GROUT MATERIALS**

- A. Sand-Cement Grout: Portland Cement, ASTM C150, Type I, and clean, natural sand, ASTM C144, or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water

required for placement and hydration. Water soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C 1218M

## **2.8 CONCRETE MIXES**

- A. Prepare design mixes to match Resident Engineer's sample for each type of concrete required.
  - 1. Fly ash, granulated blast-furnace slag, metakaolin, and silica fume are not permitted.
- B. Design mixes shall be prepared by a qualified independent testing agency or by qualified precast plant personnel at fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by PCI MNL 117 when tested in accordance with ASTM C1218/C1218M.
- D. Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on project, to provide normal-weight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 34.5 MPa (5000 psi).
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
  - 3. Release Strength at Transfer of Prestress: 24.1 MPa (3500 psi).
- E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
- G. When included in design mixes, add other admixtures to concrete mixes according to manufacturer's written instructions.

## **2.9 MOLD FABRICATION**

- A. Molds: Accurately construct and maintain molds, mortar tight, within fabrication tolerances and of sufficient strength to withstand pressures due to concrete-placement and vibration operations and temperature changes and for prestressing and detensioning operations.
  - 1. Form joints are not permitted on faces exposed to view in the finished work.
  - 2. Edge and Corner Treatment: Uniformly chamfered.
  - 3. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

## **2.9 FABRICATION**

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
  - 1. Weld headed studs and deformed bar anchors used for anchorage.

- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in units as indicated or if not indicated, as required for a complete and secure installation.
- D. Cast-in openings larger than 250 mm (10 inches) in any dimension. Do not drill or cut openings or reinforcing without approval of Resident Engineer.
- E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabrication, placing, and supporting reinforcement.
  - 1. Place reinforcing steel and prestressing strand to maintain at least 19 mm (3/4 inch) minimum concrete cover. Increase cover requirements for reinforcing steel to 38 mm (1-1/2 inches) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete.
  - 2. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
  - 3. Reinforce units to resist handling, transportation, and erection stresses.
- F. Mix concrete according to PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.
  - 1. The following mix design/casting techniques is to be used:
    - a. A single design mix throughout the entire thickness of panel.
- G. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117 for hot and cold weather concrete placement.
- H. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.
- I. Identify pickup points of units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each unit on a surface that will not show in finished structure.
- J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strengths is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

- K. Repair damaged units to meet acceptability requirements of PCI MNL 117 and the Resident Engineer.
- L. Discard and replace units that do not comply with requirements.
- m. Color: The color shall be generally equal to the approved sample(s) when viewed in direct daylight at a distance of 20'-0". Color variation between units shall be minimal.

## **2.10 FABRICATION TOLERANCES**

- A. Fabricate units straight, smooth, and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.
- B. Fabricate architectural trim units such as sills, lintels, coping, cornices, quoins, medallions, bollards, benches, planters, and pavers, with tolerances meeting PCI MNL 135.

## **2.11 FINISHES**

- A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight and sharp. Finish exposed-face surfaces of units to match approved design reference sample and as follows:
  - 1. PCI's "Architectural Precast Concrete –Color and Texture Selection Guide," of plate numbers indicated.
  - 2. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections and insulation from acid attack.
- B. Finish exposed surfaces of units to match face-surface finish.
- C. Finish unexposed surfaces of units by float finish.

## **2.12 SOURCE QUALITY CONTROL**

- A. Quality-Control Testing: Test and inspect precast concrete according to Section 01 45 29, TESTING LABORATORY SERVICES and PCI MNL 117 requirements respectively.
- B. Testing: If there is evidence that the concrete strength of precast concrete units may be deficient, Precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to PCI MNL 117:
  - 1. Test results will be made in writing on the same day that tests are performed, with copies to Resident Engineer, Contractor, and precast concrete fabricator. Test reports will include the information required in Section TESTING LABORATORY SERVICES and the following:
    - a. Identification mark and type of precast concrete units represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-

- diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- C. Defective or Damaged Work: Units that do not comply with acceptability requirements, including concrete strength, manufacturing tolerances, and color and texture range are unacceptable. Chipped, spalled or cored units may be repaired, if repaired units match the visual mock-up. The Resident Engineer reserves the right to reject any unit if it does not match the accepted samples and visual mock-up. Replace unacceptable units with precast concrete units that comply with requirements.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Deliver anchorage devices that are embedded in or attached to the building structural frame or foundation before start of such work. Provide locations, setting diagrams, and templates for the proper installation of each anchorage device.
- B. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install units until supporting structural framing has attained minimum allowable design strength or supporting steel or other structure is structurally ready to receive loads from precast.

### **3.2 ERECTION**

- A. Erect level, plumb and square within the specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.
1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
  2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
  3. Remove projecting lifting devices and use sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.
  4. Unless otherwise shown provide for uniform joint widths of 3/8-inch.
  5. Do not install any units that have any defects that exceed the acceptable PCI MNL-117 tolerances for dimension and color. Do not install any damaged units.
- B. Connect units in position by bolting, welding, grouting, or as otherwise indicated on approved Erection Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and/or grouting are completed.
1. Disruption of roof flashing continuity by connections is not permitted; concealment within roof insulation is acceptable.

2. Welding: Comply with applicable requirements for welding.
    - a. Protect units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
    - b. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS.
    - c. Clean weld affected metal surfaces and apply a minimum 100  $\mu$ m (0.004 inch) thick coat of galvanized repair paint to galvanized surfaces in conformance with ASTM A780.
    - d. Visually inspect all welds critical to precast connections. Visually check all welds for completion and remove, reweld or repair all defective welds.
  3. At bolted connections, use lock washers, tack welding, or other acceptable means to prevent loosening of nuts after final adjustment.
    - a. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connection apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.
  4. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
- C. Attachments: Upon approval of Resident Engineer, precast pre-stressed products may be drilled or "shot" for fasteners or small openings. Provided reinforcing or pre-stressing steel is not damaged or cut.
1. Should spalling occur, repair according to this specification section.
- D. Venting and Weeps: Where precast concrete panels form the outer wythe of cavity wall construction, vent the cavity wall.
1. Use polyvinyl chloride plastic tubing to vent the cavity.
  2. Place plastic vent tubes "tilted down and out" in horizontal and vertical joints.
  3. Space vent tubes in accordance with shop drawings, but not less than two vents per panel or approximately 1220 mm (4 feet) on centers.
- E. Setting: Where shown, fill joints with cement mortar specified in Section 04 05 13, MASONRY MORTARING.
1. Clean surfaces forming beds and other joints for precast concrete panels of dust, dirt, and other foreign matter, and wet thoroughly to prevent suction before precast concrete, elements are set.
  2. Set precast element level and true to line with uniform joints filled completely with mortar.

Rake out joints 25 mm (1-inch) deep for pointing or sealants.

Joints required to have only sealant: Kept free of mortar for full depth.

3. Keep exposed faces of precast concrete elements free of mortar.
  4. Remove wedges, spacers, or other appliances which are likely to cause staining from joints.
  5. Where parging is shown, parge back of elements solid with mortar. Apply parging without skips or holidays.
- F. Pointing: Wash and brush clean, leaving joints free from loose mortar, dust and other foreign material.
1. Carefully point with a slightly concave joint.
  2. Mortar for pointing as specified in Section 04 05 13, MASONRY MORTARING. Use same material and color sand used in fabrication of precast concrete elements when specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- G. Sealing of Joints: Where shown and where required to make work watertight: clean, dry and seal joints between precast concrete elements and between precast elements and adjoining materials as specified in Section 07 92 00, JOINT SEALANTS.

### **3.3 ERECTION TOLERANCES**

- A. Erect units level, plumb, square, true, and in alignment without exceeding the erection tolerances of PCI MNL 117, Appendix I.

### **3.4 FIELD QUALITY CONTROL**

- A. Refer to Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Testing agency will report test results promptly and in writing to Contractor and Resident Engineer.
- C. Repair or remove and replace work that does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### **3.5 REPAIRS**

- A. Repairs may be permitted provided structural adequacy of units and appearance are not impaired.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 6 m (20 feet).
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780.
- D. Remove and replace damaged units when repairs do not meet requirements.



### **3.6 CLEANING**

- A. Clean all surfaces of precast concrete to be exposed to view, as necessary, prior to shipping.
- B. Clean mortar, plaster, fireproofing, weld slag, and any other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
  - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
  - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

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**SECTION 03 49 00**  
**GLASS-FIBER-REINFORCED CONCRETE (GFRC)**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes plant-cast glass-fiber-reinforced polymer concrete (GFRC) wall units including embedded hardware, loose connection hardware, and integrated steel stud support framing.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include GFRC design mixes.
- B. Shop Drawings: Show fabrication and installation details for GFRC panels including the following:
  - 1. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 2. Panel elevations, sections, and dimensions.
  - 3. Thickness of facing mix, GFRC backing, and bonding pads for typical panels.
  - 4. Finishes.
  - 5. Joint and connection details.
  - 6. Lifting and Erection details.
  - 7. Panel frame details for typical panels including sizes, spacings, thickness, and yield strength of various members.
  - 8. Location and details of connection hardware attached to structure.
  - 9. Size, location, and details of flex, gravity, and seismic anchors for typical panels.
  - 10. Other items sprayed into panels.
  - 11. Erection sequence for special conditions.
  - 12. Relationship to adjacent materials.
  - 13. Description of loose, cast-in, and field hardware.
  - 14. Steel support frame system.
- C. Samples: Representative of finished exposed face of GFRC showing the full range of colors and textures specified, 12 by 12 inches (305 by 305 mm) and of actual thickness.

**1.3 INFORMATIONAL SUBMITTALS**

- A. Qualification data.
- B. Welding certificates.
- C. Source quality-control program.

#### **1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.5 QUALITY ASSURANCE**

- A. Design Responsibility: Design precast polymer concrete panels by a registered professional engineer employed or retained by panel manufacture, licensed to practice in the State of Arkansas.
- B. Manufacturer Qualifications: Firm with a demonstrated capability to produce precast polymer concrete products of quality and scope required for this Project and actively involved in precast polymer production for at least 10 years. Manufacturer must have sufficient production capacity to produce, transport, and deliver required units without causing delay in the work.
- C. Source Limitations: Obtain GFRC panels from single source from single manufacturer.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."
- E. PCI Manuals: Comply with PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels" and PCI MNL 130, "Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products."
- F. AISI Specifications: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- G. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical wall area as shown on Drawings separately from building.
- H. Preinstallation Conference: Conduct conference at Project site.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Handle and transport GFRC panels to avoid damage, according to manufacturer's written instructions..
- B. Store GFRC panels to protect from contact with soil, staining, and physical damage, according to manufacturer's written instructions.
  - 1. Place stored units so that identification markings are readily accessible.

## **1.7 WARRANTY**

- A. Panel systems shall be guaranteed against defects in materials and workmanship for a period of five (5) years from the date of completion.
  - 1. Defective panels shall be repaired or replaced as required.

## **1.8 RELATED WORK**

- A. Spray-Applied Cellulosic Insulation: Section 072113 – THERMAL INSULATION.

# **PART 2 - PRODUCTS**

## **2.1 GFRC MATERIALS**

- A. Portland Cement: ASTM C 150; Type I, II, or III.
  - 1. For surfaces exposed to view in finished structure, use [gray] [white] of same type, brand, and source throughout GFRC production.
- B. Glass Fibers: Alkali resistant, with a minimum zirconia content of 16 percent, 1 to 2 inches (25 to 50 mm) long, specifically produced for use in GFRC, and complying with PCI MNL 130.
- C. Sand: Washed and dried silica, complying with composition requirements in ASTM C 144; passing No. 20 (0.85-mm) sieve with a maximum of 2 percent passing No. 100 (0.15-mm) sieve.
- D. Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.
- E. Water: Potable; complying with chemical limits of PCI MNL 130.
- F. Polymer-Curing Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130.

## **2.2 ANCHORS, CONNECTORS, AND MISCELLANEOUS MATERIALS**

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Carbon-Steel Bars: ASTM A 108, AISI Grade 1018.
- C. Bolts: ASTM A 307 or ASTM A 325 (ASTM F 568M or ASTM A 325M).
- D. Shop Primer: For exposed carbon steel anchors, SSPC-Paint 13.

- E. Galvanized Finish or Zinc Plated: For exposed carbon steel anchors, ASTM A 153, hot dipped after fabrication.

## **2.3 PANEL FRAME MATERIALS**

- A. Cold-Formed Steel Framing: Manufacturer's standard C-shaped steel studs, complying with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members," minimum uncoated steel thickness of 0.053 inch (1.34 mm). Fabricate of material, size, shape, weight, and details as indicated on shop drawings.
  - 1. Galvanized stud and trucks, formed from steel conforming to ASTM A 446, Grade D.
  - 2. Finish, hot dipped galvanized, ASTM A 525 with minimum G-60 coating.
- B. Hollow Structural Sections: Steel tubing, ASTM A 500, Grade B, or ASTM A 513.
- C. Steel Channels and Angles: ASTM A 36/A 36M.

## **2.4 GFRC MIXES**

- A. General: Combine thermosetting resin, graded silica sand and stable, non fading paste pigments premixed in prior proportions and reinforced with woven fiberglass cloth to produce panels that comply with the following:
  - 1. Compressive Strength (ASTM D695) 12,000 psi.
  - 2. Tensile Strength (ASTM D638) 1,500-3,000 psi.
  - 3. Water Absorption - Less than 0.1 percent.
  - 4. Coefficient of Expansion - 1.0000125inch/deg.F.
  - 5. Thickness -3/4 in minimum.
  - 6. Combustibility (ASTM E36) Noncombustible.
  - 7. Flammability (ASTM E84) -ClassA.

## **2.5 PANEL FRAME FABRICATION**

- A. Fabricate panel frames and accessories plumb, square, true to line, and with components securely fastened, according to Shop Drawings and requirements in this Section.
  - 1. Fasten cold-formed metal framing members by welding. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  - 2. Fasten framing members of hollow structural sections, steel channels, or steel angles by welding. Comply with AWS D1.1/D1.1M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  - 3. Weld flex, gravity, and seismic anchors to panel frames.

- 4. Touch-up welds after fabrication with galvanized paint.
- B. Reinforce, stiffen, and brace framing assemblies, if necessary, to withstand handling, delivery, and erection stresses. Lift fabricated assemblies in a manner that prevents damage or significant distortion.

## **2.6 GFRC FABRICATION**

- A. Forms: Construct of rigid materials that will result in finished product conforming to profiles, dimension, and tolerances indicated.
- B. Proportioning and Mixing: Carefully measure amounts of mix constituents to achieve desired mix proportions according to PCI NML 130 procedures.
- C. Hand form and consolidate intricate details, incorporate formers or infill materials, and over spray before material reaches initial set to ensure complete bonding.
- D. Attach panel frame to GFRC before initial set of GFRC backing, maintaining a minimum clearance of 1/2 inch (13 mm) from GFRC backing, and without anchors protruding into GFRC backing.
- E. Build up homogeneous GFRC bonding pads over anchor feet, maintaining a minimum thickness of 1/2 inch (13 mm) over tops of anchor feet, before initial set of GFRC backing.
- F. Inserts and Embedments: Build up homogeneous GFRC bosses or bonding pads over inserts and embedments to provide sufficient anchorage and embedment to comply with design requirements.
- G. Curing: Employ initial curing method that will ensure sufficient strength for removing units from mold. Comply with PCI MNL 130 procedures.
- H. Dimensional Tolerances: Manufacture units so that each panels complies with following dimensional tolerances.
  - 1. Overall height and width of finished units, measured to face adjacent to form.
    - a) 10 feet or under, plus or minus 1/8 inch.
    - b) Over 10feet, plus or minus 1/8 inch per 10 feet.
  - 2. Angular Deviation of Plane of Side Mold: 1/32 inch per 3 inches of depth or 1/16 inch total, whichever is greater.
  - 3. Variation from Square of Designated Skew (difference in length of to diagonal measurements): 1/8 inch per 6 feet or 1/4 inch total, whichever is greater.
  - 4. Steel Studs Frames: Plus or minus ~ inch.
- I. Finishes: Exposed panel faces to match existing building elements or approved samples. Joint markings, grain, or other obvious defects on panel faces are not accepted.

- J. Panel Identification: Mark each precast polymer concrete panel to correspond with identification mark on shop drawings. Mark each panel with its casting date.

## **2.7 SOURCE QUALITY CONTROL**

- A. Quality-Control Testing: Establish and maintain a quality-control program for manufacturing GFRC panels according to PCI MNL 130.

## **2.8 COLOR AND TEXTURE**

- A. As selected from manufacturer's full range of colors and textures, and as approved by the Resident Engineer.
- B. See Section 090600, Schedule for Finishes.

# **PART 3 - EXECUTION**

## **3.1 INSPECTION**

- A. Erector Responsibility: Prior to installing units, check job site dimensions affecting erection of precast polymer concrete units. If discrepancies do exist, do not proceed until corrected or until installation requirements are modified as acceptable to Panel Manufacturer and Resident Engineer.

## **3.2 ERECTION**

- A. Install clips, hangers, and other accessories required for connecting GFRC panels to supporting members and backup materials.
- B. Lift GFRC panels and install without damage.
- C. Install GFRC panels level, plumb, square, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.
  - 1. Maintain horizontal and vertical joint alignment and uniform joint width.
  - 2. Remove projecting hoisting devices.
- D. Connect GFRC panels in position by bolting or welding, or both, as indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as possible after connecting is completed.
- E. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.3 requirements for welding, appearance, quality of welds, and methods used in correcting welding work.
  - 1. Protect GFRC panels from damage by field welding or cutting operations, and provide noncombustible shields as required.
  - 2. Have qualified welder performing welding.
- F. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

G. Erect GFRC panels to comply with the noncumulative tolerances of PCI MNL 130.

### **3.3 REPAIRS**

A. Repairs will be permitted provided structural adequacy of GFRC panel and appearance are not impaired, as approved by Resident Engineer.

1. Patching Mix: Match color and texture of precast polymer concrete unit. Blend and mix materials so that cured patching matches adjacent surfaces.

B. Remove and replace damaged GFRC panels when repairs do not comply with requirements, or do not meet the approval for the Resident Engineer.

### **3.4 CLEANING AND PROTECTION**

A. Perform cleaning procedures, if necessary, according to GFRC manufacturer's written instructions. Clean soiled GFRC surfaces with detergent and water, using soft fiber brushes and sponges, and rinse with clean water. Prevent damage to GFRC surfaces and staining of adjacent materials.

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**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 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
  - 2. Section 04 20 00, UNIT 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 Resident Engineer to perform tests specified below.
- B. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to Resident Engineer.

**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 Resident Engineer.
- E. After tests have been made and materials approved, do not change without additional test and approval of Resident Engineer.
- 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. During progress of work, testing laboratory specified in Section 01 45 29, 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. Indicating that following items meet specifications:
    - a. Portland cement.
    - b. Masonry cement.
    - c. Mortar cement.
    - d. Hydrated lime.
    - e. Fine aggregate (sand).
    - f. 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 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.7 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.

## **1.8 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
  - C144-04 .....Aggregate for Masonry Mortar
  - C150-05 .....Portland Cement
  - C207-06 .....Hydrated Lime for Masonry Purposes
  - C270-07 .....Mortar for Unit Masonry
  - 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.
- B. Test sand for color value in accordance with ASTM C40. Sand producing color darker than specified standard is unacceptable.

### **2.3 MASONRY CEMENT**

- A. ASTM C91. Type N, S, or M.

### **2.4 MORTAR CEMENT**

ASTM C1329, Type N, S or M.

### **2.5 PORTLAND CEMENT**

- A. 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 mortar, masonry, and metal.

## **2.8 POINTING MORTAR**

- A. For Precast Concrete: Proportion by volume; One part white Portland cement, two parts white sand, and 1/5 part hydrated lime.

## **2.9 MASONRY MORTAR**

- A. Conform to ASTM C270.
- B. Admixtures:
  - 1. Do not use mortar admixtures and color admixtures, unless approved by Resident Engineer.
  - 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.

## **2.10 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 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. 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 precast concrete panels, and waterproof parging below grade.
- B. Use Type S mortar for masonry containing vertical reinforcing bars (non-engineered) and masonry below grade.
- C. For brick veneer over frame back up walls, use Type N portland cement-lime mortar or Type S masonry cement or mortar cement mortar.
- D. Use Type N mortar for other above-grade masonry work, except as otherwise specified.
- E. Use Type N mortar for tuck pointing work.
- F. Use pointing mortar for items specified.

- - - E N D - - -

**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: Section 04 05 13, MASONRY MORTARING
- B. Steel lintels and shelf angles: Section 05 50 00, METAL FABRICATIONS.
- C. Cavity insulation: Section 07 21 13, THERMAL INSULATION.
- 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. Face brick, sample panel, 200 mm by 400 mm (8 inches by 16 inches,) showing full color range and texture of bricks, bond, and proposed mortar joints.
  - 2. Anchors, and ties, one each and joint reinforcing 1200 mm (48 inches) long.
  - 3. Weep, vent, and cavity drainage accessories.
- 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.
- 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. Face brick.
  - 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 SAMPLE PANEL**

- A. Before starting masonry, lay up a sample panel in accordance with Masonry Standards Joint Committee (MSJC) and Brick Industry Association (BIA).
  1. Use masonry units from random cubes of units delivered on site.
  2. Include reinforcing, ties, and anchors.
- B. Use sample panels approved by Resident Engineer for standard of workmanship of new masonry work.
- C. Use sample panel to test cleaning methods.

#### **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.6 WARRANTY**

Warrant exterior masonry walls against moisture leaks and subject to terms of "Warranty of Construction" Article in Section 007200, GENERAL CONDITIONS, except that warranty period shall be five years.

#### **1.7 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - 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, Carbon, Hot-Wrought,  
Special Quality, Mechanical PropertiesC34-03 Structural Clay  
Load-Bearing Wall Tile
- C62-05 .....Building Brick (Solid Masonry Units Made From Clay or Shale)
- C67-07 .....Sampling and Testing Brick and Structural Clay Tile
- C476-02 .....Standard Specification for Grout for Masonry
- C612-04 .....Mineral Fiber Block and Board Thermal Insulation
- C652-11 .....Standard Specification for Hollow Brick (Hollow Masonry Units  
Made From Clay or Shale)
- D1056-07 .....Flexible Cellular Materials - Sponge or Expanded Rubber
- 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
- F. Brick Industry Association - Technical Notes on Brick Construction (BIA):  
11-1986 .....Guide Specifications for Brick Masonry, Part I  
11A–1988.....Guide Specifications for Brick Masonry, Part II  
11B–1988.....Guide Specifications for Brick Masonry, Part III Execution  
11C-1998 .....Guide Specification for Brick Masonry Engineered Brick  
Masonry, Part IV  
11D-1988 .....Guide Specifications for Brick Masonry Engineered Brick  
Masonry, Part IV continued
- 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 BRICK**

- A. Face Brick:
1. ASTM C652, Grade SW, Type FBA.
  2. Brick when tested in accordance with ASTM C67: Classified slightly efflorescent or better.
  3. Size: King



- B. Building Brick: ASTM C62, Grade SW for backup, interior work, and where in contact with earth.

## **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 4 mm (0.16 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 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. Adjustable Veneer Anchor for Frame Walls:
  - 1. Use adjustable plate tie system consisting of an L-Plate (vertical) C-tie (V-shaped wire), and an insulation support.
  - 2. Fasten anchor to stud through sheathing with self-drilling and tapping screws, at vertical L-Plate, spaced not more than 400 mm (16 inches) on center horizontally, and not more than 450 mm (18 inches) on center vertically.

3. Anchor: Minimum 2 mm (16 gage) thick galvanized steel angle shaped anchor strap. Provide hole in vertical leg for fastener. Provide hole near end of outstanding leg to suit upstanding portion of tie.
4. Tie: Fabricate from 5 mm (0.20 inch) diameter galvanized cold drawn steel wire. Form "L" shape to be embedded not less than 50 mm (2 inches) into the bed joint of the masonry veneer and provide upstanding leg to fit through hole in anchor and be long enough to allow 50 mm (2 inches) of vertical adjustment.

D. Rigid 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.

## **2.4 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/Vent Products: Use one of the following, unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.
2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe.

B. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Configuration:

- a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep.

C. 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 Resident Engineer's approval.

D. 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.

E. 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.

## **2.6 MASONRY WATER REPELLANT**

- A. Sealer to be VOC Compliant (Volatile Organic Compound) silicone/silane blend. Verify with sealer manufacturer as to whether specified sealers have any negative reaction to materials they are used on. Provide submittals appropriate to materials.

1. Installer's Warranty: Provide two (2) year guarantee against defects, water penetration, efflorescence, discoloring, etc.
2. Manufacturer's Warranty: Provide ten (10) year non-prorated labor and materials warranty for moisture resistance penetration and provide manufacturer's representative to perform a Rilem II, 4 Test.
3. Workmanship: Provide treatment to existing masonry where affected by new work with a silane type penetrating water repellant material. The water repellant shall not alter the natural appearance of the masonry. Surfaces to be treated may be "damp" but should be visually dry and thoroughly clean and free of surface dirt, dust, oils and other contaminants. Water repellant shall be applied in strict accordance with manufacturers printed instructions.

## **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. 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. Partition Height:
1. Extend partitions at least 200 mm (eight inches) above suspended ceiling or to overhead construction where no ceiling occurs.
  2. Extend following partitions to overhead construction.
    - a. Where noted smoke partitions, FHP (full height partition), and FP (fire partition) and smoke partitions (SP) on drawings.
    - b. Both walls at expansion joints.

- c. Corridor walls.
  - d. Walls at stairway and stair halls, elevators, dumbwaiters, trash and laundry chute shafts, and other vertical shafts.
- F. Lintels:
  - 1. Furnish lintels at all openings of sized shown on the drawings. Refer to Lintel Schedule on Structural Drawings for details.
  - 2. Length for minimum bearing of 200 mm (8 inches) at ends.
- G. 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 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, concrete work, 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.
- H. Before connecting new masonry with previously laid, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.
- I. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.
- J. Structural Steel Encased in Masonry:
  - 1. Where structural steel is encased in masonry and the voids between the steel and masonry are filled with mortar, provide a minimum 25 mm (1 inch) mortar free expansion space between the masonry and the steel by applying a box board material to the steel before the masonry is laid.
  - 2. Do not place spacing material where steel is bearing on masonry or masonry is bearing on steel.
- K. Wetting and Wetting Test:
  - 1. Test and wet brick in accordance with BIA 11B.
  - 2. Do not wet concrete masonry units before laying.

### **3.4 ANCHORAGE**

#### **A. Veneer to Frame Walls:**

1. Use adjustable veneer tie system consisting of an L-Plate (vertical), a V-Tie (V-shaped wire) and a insulation support.
2. Fasten anchor to stud through sheathing with self drilling and tapping screw, at vertical L-Plate spaced not more than 400 mm (8 Inches) on center horizontally..
3. Space anchors not more than 400 mm (16 inches) on center vertically at each stud.

### **3.5 BRICK EXPANSION AND CONTROL JOINTS.**

#### **A. Provide brick expansion (BEJ) and 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 filler, backer rod, and sealant on exposed faces.

#### **D. Interrupt steel joint reinforcement at expansion and control joints unless otherwise shown.**

#### **E. Fill opening in exposed face of expansion and control joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.**

### **3.6 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.**

### **3.7 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.**

### **3.8 BRICKWORK**

#### **A. Lay clay brick in accordance with BIA Technical Note 11 series.**

#### **B. Laying:**

1. Lay brick in running bond with course of masonry bonded at corners unless shown otherwise.  
Match bond of existing building on alterations and additions.
2. Maintain bond pattern throughout.
3. Do not use brick smaller than half-brick at any angle, corner, break or jamb.
4. Where length of cut brick is greater than one half but less than a whole brick, maintain the vertical joint location of such units.
5. Lay exposed brickwork joints symmetrical about center lines of openings.
6. Do not structural bond multi-wythe brick walls unless shown.
7. Before starting work, lay facing brick on foundation wall and adjust bond to openings, angles, and corners.
8. Lay brick for sills with wash and drip.
9. Build solid brickwork as required for anchorage of items.

C. Joints:

1. Exterior and interior joint widths: Lay for three equal joints in 200 mm (eight inches) vertically, unless shown otherwise.

D. Weep Holes:

1. Install weep holes at 600 mm (24 inches) on center in bottom of vertical joints of exterior masonry veneer or cavity wall facing over foundations, bond beams, and other water stops in the wall.
2. Form weep holes using wicks made of mineral fiber insulation strips turned up 200 mm (8 inches) in cavity. Anchor top of strip to backup to securely hold in place.
3. Install mortar net in cavity approximately 75 mm (3 inches) high between weep holes.

E. Cavity Type Exterior Walls:

1. Keep air space clean of mortar accumulations and debris.
  - a. Clean cavity by use of hard rubber, wood or metal channel strips having soft material on sides contacting wythes.
  - b. Lift strips with wires before placing next courses of horizontal joint reinforcement or adjustable cavity wall ties.
2. Veneer Framed Walls:
  - a. Build with 100 mm (4 inches) of face brick over sheathed stud wall with air space.
  - b. Keep air space clean of mortar accumulations and debris.

### **3.9 WEEP HOLES, CAVITY DRAINAGE, AND VENTS**

- A. General: Install embedded weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf

angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated. Do not align vents immediately over weeps.

- B. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
  - 1. Use specified weep/vent products to form weep holes.
  - 2. Space weep holes 24 inches o.c., unless otherwise indicated.
- C. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Accessories" Article.
- D. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

### **3.10 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. Brickwork:
  - 1. First wet surfaces with clean water, then wash down with a solution of soapless detergent. Do not use muriatic acid.
  - 2. Brush with stiff fiber brushes while washing, and immediately thereafter hose down with clean water.
  - 3. Free clean surfaces of traces of detergent, foreign streaks, or stains of any nature.

--- E N D ---



**SECTION 05 12 00**  
**STRUCTURAL STEEL FRAMING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Steel Joist: Section 05 21 00, STEEL JOIST FRAMING.
- C. Steel Decking: Section 05 31 00, STEEL DECKING.
- D. Composite Steel Deck: Section 05 36 00, COMPOSITE METAL DECKING.
- E. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.
- F. Painting: Section 09 91 00, PAINTING.

**1.3 QUALITY ASSURANCE:**

- A. Fabricator and erector shall maintain a program of quality assurance in conformance with Section 8, Code of Standard Practice for Steel Buildings and Bridges. Work shall be fabricated in an AISC certified Category Conventional Steel Structures.
- B. Before authorizing the commencement of steel erection, the controlling contractor shall ensure that the steel erector is provided with the written notification required by 29 CFR 1926.752. Provide copy of this notification to the Resident Engineer.

**1.4 TOLERANCES:**

Fabrication tolerances for structural steel shall be held within limits established by ASTM A6, by Section 7, Code of Standard Practice for Buildings and Bridges, and by Standard Mill Practice - General Information (AISC ASD Manual, Ninth Edition, Page 1-145 LRFD Manual, 13th Edition, Page 1-117), 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. Cooling Tower Supports: Unless otherwise shown on the Contract Documents, the design, location, and dimensions of cooling tower supports are based upon a typical installation.

Contractor shall furnish and install at no additional cost to the Government, adequate structural supports for equipment furnished for this installation. Design shall be based on loads supplied by the Cooling Tower Manufacturer and must include an allowance for wind and other lateral loads. Submit detailed drawings and design calculations, prepared by a registered Professional Engineer licensed to perform services in the Jurisdiction where the project is located, for approval before members are fabricated.

**1.6 REGULATORY REQUIREMENTS:**

- A. AISC: Specification for Structural Steel Buildings - Allowable Stress Design.
- 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.
  - 2. Cooling Tower Supports: If not designed on the Structural Drawings.
- F. Record Surveys.

**1.8 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill

these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **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 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)
  3. Code of Standard Practice for Steel Buildings and Bridges (2010).
- C. American National Standards Institute (ANSI):
  - B18.22.1-65(R2008) ..... Plain Washers
  - B18.22M-81(R2000)..... Metric Plain Washers
- D. American Society for Testing and Materials (ASTM):
  - A6/A6M-09..... Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
  - A36/A36M-08..... Standard Specification for Carbon Structural Steel
  - A53/A53M-10..... Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
  - A123/A123M-09..... Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - A307-10 ..... Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
  - A325-10 ..... Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  - A500/A500M-10..... Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

A572/A572M-07.....Standard Specification for High-Strength Low-Alloy  
Columbium-Vanadium Structural Steel

A992/A992M-06.....Standard Specification for Structural Steel Shapes

E. American Welding Society (AWS):

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

F. Research Council on Structural Connections (RCSC) of The Engineering Foundation:  
Specification for Structural Joints Using ASTM A325 or A490 Bolts

G. Military Specifications (Mil. Spec.):

MIL-P-21035 .....Paint, High Zinc Dust Content, Galvanizing, Repair

H. Occupational Safety and Health Administration (OSHA):

29 CFR Part 1926-2001 .....Safety Standards for Steel Erection

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

A. Structural Steel: ASTM A36, A572, Grade 50, A992.

B. Structural Tubing: ASTM A500, Grade B.

C. Steel Pipe: ASTM A53, Grade B.

D. Bolts, Nuts and Washers:

1. High-strength bolts, including nuts and washers: ASTM A325.

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.

E. Zinc Coating: ASTM A123.

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

## **PART 3 - EXECUTION**

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

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

B. High-Strength Bolts: High-strength bolts tightened to a bolt tension not less than 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 12 13**  
**ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Section includes architecturally exposed structural-steel framing.
  - 1. Requirements in Section 051200 "Structural Steel Framing" also apply to AESS framing.

**1.2 DEFINITIONS**

- A. Architecturally Exposed Structural Steel: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.

**1.3 RELATED WORK**

- A. Materials Testing and Inspection during Construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Steel Joist: Section 05 21 00, STEEL JOIST FRAMING
- C. Steel Decking: Section 05 31 00, STEEL DECKING
- D. Composite Steel Decking: Section 05 36 00, COMPOSITE METAL DECKING
- E. Fireproofing: Section 07 81 23, INTUMESCENT FIREPROOFING.
- F. Painting: Section 09 91 00, PAINTING

**1.4 SUBMITTALS**

- A. Shop Drawings: Show fabrication of AESS components.
  - 1. Indicate welds by standard AWS symbols. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
  - 2. Indicate type, size, and length of bolts.
- B. Samples: Submit samples of AESS to set quality standards for exposed welds.
  - 1. Two steel plates, 3/8 by 8 by 4 inches (9.5 by 200 by 100 mm), with long edges joined by a groove weld and with weld ground smooth.
  - 2. Steel plate, 3/8 by 8 by 8 inches (9.5 by 200 by 200 mm), with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches (100 by 150 by 9.5 mm), welded to plate with a continuous fillet weld and with weld ground smooth and blended.

**1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of

Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- B. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P2 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Preinstallation Conference: Conduct conference at Project site.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
  1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

## **1.8 PROJECT CONDITIONS**

- A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

## **PART 2 - PRODUCTS**

### **2.1 BOLTS, CONNECTORS, AND ANCHORS**

- A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies.
  1. Finish: Plain.
- B. Corrosion-Resisting (Weathering Steel), Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 3, round-head assemblies.

### **2.2 PRIMER**

- A. Primer: Comply with Section 099100 "PAINTING".
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

## **2.3 FABRICATION**

- A. In addition to special care used to handle and fabricate AESS, comply with the following:
  - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes.
  - 2. Grind sheared, punched, and flame-cut edges smooth.
  - 3. Fabricate with exposed surfaces free of mill marks.
  - 4. Fabricate with exposed surfaces free of seams to maximum extent possible.
  - 5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
  - 6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
  - 7. Fabricate to the tolerances specified in AISC 303 for steel that is designated AESS.
  - 8. Seal-weld open ends of hollow structural sections with 3/8-inch (9.5-mm) closure plates.
- B. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch (3.2 mm) with a tolerance of 1/32 inch (0.8 mm).
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  - 2. Baseplate Holes: Cut, drill, or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## **2.4 SHOP CONNECTIONS**

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:
  - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
  - 2. Use weld sizes, fabrication sequence, and equipment that limit distortions to allowable tolerances.
  - 3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS is exposed to weather.



4. Provide continuous welds of uniform size and profile where AESS is welded.
5. Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch (plus 1.5 mm, minus 0 mm).
6. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch (plus 1.5 mm, minus 0 mm). Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
7. Remove backing bars or runoff tabs; back-gouge and grind steel smooth.
8. At locations where welding on the far side of an exposed connection of AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
9. Make fillet welds oversize and grind to uniform profile with smooth face and transition.
10. Make fillet welds of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

## **2.5 GALVANIZING**

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
  1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
  2. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
  3. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

## **2.6 SHOP PRIMING**

- A. Shop prime steel surfaces except the following:
  1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
  2. Surfaces to be field welded.
  3. Surfaces to be high-strength bolted with slip-critical connections.
  4. Surfaces to receive sprayed fire-resistive materials.
  5. Surfaces to receive intumescent paint materials
  6. Galvanized surfaces.
- B. Surface Preparation for Nongalvanized Steel:
  1. SSPC-SP 3, "Power Tool Cleaning."
  2. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
  3. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
  4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

5. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  6. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
- C. Preparing Galvanized Steel for Shop Priming: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 ERECTION**

- A. Provide temporary shores, guys, braces, and other supports during erection to keep AECS secure, plumb, and in alignment.
1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.
- B. Set AECS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
1. Erect AECS to the tolerances specified in AISC 303 for steel that is designated AECS.
- C. Do not use thermal cutting during erection.

### **3.3 FIELD CONNECTIONS**

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.
  2. Orient bolt heads in same direction for each connection and to maximum extent possible in same direction for similar connections.
- B. Weld Connections: Comply with requirements in "Weld Connections" Paragraph in "Shop Connections" Article.
1. Remove backing bars or runoff tabs; back-gouge and grind steel smooth.

2. Remove erection bolts, fill holes, and grind smooth.
3. Fill weld access holes and grind smooth.

### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AECS as specified in Section 051200 "Structural Steel Framing." The testing agency will not be responsible for enforcing requirements relating to aesthetic effect.
- B. Resident Engineer will observe AECS in place to determine acceptability relating to aesthetic effect.

### **3.5 REPAIRS AND PROTECTION**

- A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

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**SECTION 05 21 00**  
**STEEL JOIST FRAMING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies open web, longspan, and deep longspan steel joists.

**1.2 RELATED WORK:**

- A. Structural Steel: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- B. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.
- 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.
- D. Design Calculations: If requested by the Resident Engineer, submit complete calculations covering the design of all members and connections. Calculations must be specifically applicable to the joists supplied.

**1.7 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and

applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.8 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.

## **1.9 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 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.

## **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 and joist girders, 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.
  - 8. Header Units: Provide header units to support all joists at openings in floor or roof system not framed with steel shapes.

9. Provide supplemental steel support framing for metal deck where normal deck bearing is precluded by other framing members and minor openings.

### **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.
- C. Do not apply paint to surfaces which will receive sprayed-on fireproofing.

### **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 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. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.
- C. 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: 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".

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the



requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

### **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.

### **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
  - A611-97 .....Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled
  - A653/A653M-08.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
- C. 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)
- 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. Military Specifications (Mil. Spec.)
  - MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

- A. Steel Decking: ASTM A653, Structural Quality.
- B. Galvanizing: ASTM A653, G60.
- 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. Primer coating shall be compatible with strayed-on fireproofing material.
- 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. 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.
  - 5. Seat Angles for Deck: Provide where a beam does not frame into a column.
  - 6. 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 2: Corrugated deck units used as a permanent form for reinforced concrete slabs. Comply with the depth and minimum gauge requirements as shown on the Contract Documents.
  - 1. Finish: Galvanized.
- C. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces utilized to act as a permanent support for all superimposed loads. Comply with the depth and minimum gauge requirements as shown on the Contract Documents.
  - 1. Wide Rib (Type B) deck.
  - 2. Finish: Galvanized G-60.
- D. 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.
- E. Steel decking units used for interstitial levels shall include an integral system.
  - 1. System to provide a simple point of attachment for light duty hanger devices.
  - 2. System to allow for flexibility for attaching hangers for support of suspended ceilings, electrical, plumbing, heating, or air conditioning items, weight not to exceed  $50 \text{ kg/m}^2$  (10 psf).
  - 3. System shall provide for a minimum spacing pattern of 300 mm (12 inches) on centers longitudinally and 600 mm (24 inches) on centers transversely.
  - 4. Maximum load suspended from any hanger is 23 kg (50 pounds).
  - 5. System consisting of fold-down type hanger tabs or lip hanger is acceptable.

## **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 2.1 kPa (45 psf) at eave overhang and 1.4 kPa (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 zinc-coated units shall be zinc rich galvanizing repair paint.

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**SECTION 05 36 00**  
**COMPOSITE METAL DECKING**

**PART 1 – GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.

**1.3 DESIGN REQUIREMENTS:**

- A. Design steel decking in accordance with American Iron And Steel Institute publication "Specifications for the Design of Cold Formed Steel Structural Members", except as otherwise shown or specified.
- B. Design all elements with the latest published version of applicable codes.

**1.4 SUBMITTALS:**

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

- H. Shear Stud Layouts: Submit drawings showing the number, pattern, spacing and configuration of the shear studs for each beam and girder.
- I. Certification: For each type and gauge of metal deck supporting concrete slab or fill, furnish certification of the specified fire ratings. Certify that the units supplied are U.L. listed as a “Steel Floor and Form Unit”.

#### **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project’s sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute’s Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.6 QUALITY ASSURANCE:**

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

#### **1.7 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Refer to the latest edition of all referenced Standards and codes.
- B. American Iron and Steel Institute (AISI):  
Specification and Commentary for the Design of Cold-Formed Steel Structural Members (Latest Edition).
- C. American Society of Testing and Materials (ASTM):  
A36/A36M-08.....Standard Specification for Carbon Structural Steel  
A108-07 .....Standard Specification for Steel Bars, Carbon, Cold Finished,  
Standard Quality  
A653/A653M-10.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized)  
or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process

- D. American Institute of Steel Construction (AISC):
  - 1. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design (Latest Edition)
- E. American Welding Society (AWS):
  - D1.1/D1.1M-10.....Structural Welding Code - Steel
  - D1.3/D1.3M-08.....Structural Welding Code - Sheet Steel
- E. Military Specifications (Mil. Spec.):
  - MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

- A. Steel Decking and all Flashings: ASTM A653, Structural Quality suitable for shear stud weld-through techniques .
- B. Galvanizing: ASTM A653, G60.
- C. Shear connector studs: ASTM A108, Grades 1015-1020, yield 350 Mpa (50,000 psi) minimum, tensile strength - 400 Mpa (60,000 psi) minimum, reduction of area 50 percent minimum. Studs of uniform diameter; heads shall be concentric and normal to shaft; stud, after welding free from any substance or defect which would interfere with its function as a shear connector. Studs shall not be painted or galvanized. Size of studs shall be as shown on drawings. Studs manufactured by a company normally engaged in the manufacture of shear studs and can furnish equipment suitable for weld-through installation of shear studs.
- D. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- E. Miscellaneous Steel Shapes: ASTM A36.
- F. Welding Electrode: E60XX minimum.
- G. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:
  - 1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
  - 2. Continuous sheet metal edging: at openings and concrete slab edges. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel shall be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures shall be limited to 3 mm (1/8 inch) maximum.



3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.
4. Seat angles for deck: Where a beam does not frame into a column.

## **2.2 REQUIREMENTS:**

- A. Steel decking depth, gage, and section properties to be as shown. Provide edges of deck with vertical interlocking male and female lip providing for a positive mechanical connection.
- B. Fabricate deck units with integral embossments to provide mechanical bond with concrete slab. In combination with concrete slab, capable of supporting total design loads on spans shown.
- C. Steel decking capable of safely supporting total, normal construction service loads without damage to decking unit.
- D. Steel decking units shall include an integral system which provides a simple point of attachment for light duty hanger devices for flexibility for attaching hangers for support of acoustical, lathing, plumbing, heating, air conditioning and electrical items. System shall provide for minimum spacing pattern of 300 mm (12 inches) on centers longitudinally and 600 mm or 900 mm (24 or 36 inches) on centers transversely. Suspension system shall be capable of safely supporting a maximum allowable load of 45 kg (100 pounds) concentrated at any one hanger attachment point. System may consist of fold-down type hanger tabs or a lip hanger.

## **PART 3 - EXECUTION**

### **3.1 ERECTION:**

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- D. Erect steel deck in accordance with manufacturer's printed instructions.
- E. Ship steel deck units to project in standard widths and cut to proper length.
- F. Provide steel decking in sufficient lengths to extend over 3 or more spans, except where structural steel layout does not permit.
- G. Place steel decking units on supporting steel framework and adjust to final position before being permanently fastening. Bring each unit to proper bearing on supporting beams. Place deck units

in straight alignment for entire length of run of flutes and with close registration of flutes of one unit with those of abutting unit. Maximum space between ends of abutting units is 13 mm (1/2 inch). If space exceeds 13 mm (1/2 inch), install closure plates at no additional cost to Government.

- H. Ceiling hanger loops, if used, must be flattened or removed to obtain bearing of units on structural steel.
- I. 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 notes on Drawings.
- J. Welding to conform to AWS D1.3 and done by competent experienced welding mechanics.
- K. Areas scarred during erection and welds shall be thoroughly cleaned and touched-up with zinc rich galvanizing repair paint. Paint touch-up is not required for welds or scars that are to be in direct contact with concrete.
- L. Provide metal concrete stops at edges of deck as required.
- M. Cutting and Fitting:
  - 1. Cut all metal deck units to proper length in the shop prior to shipping.
  - 2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the structural drawings.
  - 3. Other penetrations shown on the approved metal deck shop drawings but not shown on the structural drawings are to be located, cut and reinforced by the trade requiring the opening.
  - 4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.
  - 5. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the 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.

N. Installation of shear connector studs through previously installed metal deck to conform to AWS D1.1, Section 7, except all studs will be installed with automatically timed welding equipment and as specified below:

1. Do not place reinforcing steel temperature mesh or other materials and equipment which will interfere with stud installation on steel deck until shear connector studs are installed.
2. Steel deck sheets shall be free of oil, rust, dirt, and paint. Release water in deck's valley so that it does not become entrapped between deck and beam. Surface to which stud is to be welded shall be clean and dry.
3. Rest metal deck tightly upon top flange of structural member with bottom of deck rib in full contact with top of beam flange.
4. Weld studs only through a single thickness of deck. Place decking so that a butt joint is obtained. Place studs directly over beam web, where one row of studs are required.
5. Ferrules specially developed for the weld-through technique must be used. Ferrules shall be appropriate for size of studs used and be removed after welding.
6. Submit report of successful test program for stud base qualification as required by AWS D1.1, Appendix K.

### **3.2 CLEANING:**

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

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**SECTION 05 40 00**  
**COLD-FORMED METAL FRAMING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**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. Wood Blocking: Section 06 10 00, ROUGH CARPENTRY.
- D. Insulation: Section 07 21 13, THERMAL INSULATION.
- E. Insulated Metal Siding: Section 07 40 00, SIDING PANELS.
- F. Non-Load-Bearing Metal Stud Framing Assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- G. Exterior Sheathing and 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.

**1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.
- C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

**1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and

applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

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

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

- A. Sheet Steel for joists, studs and accessories 16 gage and heavier: ASTM A653, structural steel, zinc coated G60, with a yield of 340 MPa (50 ksi) minimum.
- B. Sheet Steel for joists, studs and accessories 18 gage and lighter: ASTM A653, structural steel, zinc coated G60, with a yield of 230 MPa (33 ksi) minimum.
- C. Galvanizing Repair Paint: MIL-P-21035B.
- D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

### **2.2 WALL FRAMING:**

- A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:
  - 1. Design Uncoated-Steel Thickness:
    - 1.20 mm (0.0474 inch)
    - 1.52 mm (0.0598 inch)
  - 2. Flange Width:
    - (1-5/8 inches)
  - 3. Web: Punched.
- B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:
  - 1. Design Uncoated-Steel Thickness: Matching steel studs.
  - 2. Flange Width: Manufacturer's standard deep flange where indicated, standard flange elsewhere.

### **2.3 FRAMING ACCESSORIES:**

- A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 ksi).
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  - 1. Supplementary framing.
  - 2. Bracing, bridging, and solid blocking.
  - 3. Web stiffeners.
  - 4. Deflection track and vertical slide clips.

5. Stud kickers and girts.
6. Reinforcement Plates.

## **2.4 ANCHORS, CLIPS, AND FASTENERS:**

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

## **2.5 REQUIREMENTS:**

- A. Welding in accordance with AWS D1.3
- B. Furnish members and accessories by one manufacturer only.

## **PART 3 - EXECUTION**

### **3.1 FABRICATION:**

- A. Framing components may be preassembled into panels. Panels shall be square with components attached.
- B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.
- C. Hold members in place until fastened.
- D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
  1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

- E. Where required, provide specified insulation in double header members and double jamb studs which will not be accessible after erection.

### **3.2 ERECTION:**

- A. Handle and lift prefabricated panels in a manner as to not distort any member.
- B. Securely anchor tracks to supports as shown.
- C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.
- D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.
- E. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.
- F. Install headers in all openings that are larger than the stud spacing in that wall.
- G. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows at a max spacing of 48" o.c.
- H. Studs in one piece for their entire length, splices will not be permitted.
- I. Provide temporary bracing and leave in place until framing is permanently stabilized.
- J. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.
- K. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

### **3.3 TOLERANCES:**

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

### **3.4 FIELD REPAIR:**

Touch-up damaged galvanizing with galvanizing repair paint.

--- E N D ---



**SECTION 05 50 00  
METAL FABRICATIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.
- B. Items specified:
  - 1. Support for Wall and Ceiling Mounted Items
  - 2. Frames
  - 3. Guards
  - 4. Covers and Frames for Pits and Trenches
  - 5. Metal Bollards
  - 6. Gratings
  - 7. Loose Lintels
  - 8. Plate Door Sill
  - 9. Safety Nosings
  - 10. Ladders
  - 11. Railings

**1.2 RELATED WORK**

- A. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Prime and finish painting: Section 09 91 00, PAINTING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:

|               |
|---------------|
| Safety nosing |
|---------------|

- C. Shop Drawings:
  - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
  - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
  - 3. Provide templates and rough-in measurements as required.

- D. 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 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.
- B. Provide documentation of recycled content for all materials possible. Be sure that documentation includes pre- and post-consumer content if possible.
- C. Provide documentation of extraction and manufacture distances for all materials possible.

#### **1.5 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.

#### **1.6 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 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
- A391/A391M-01 ..... Grade 80 Alloy Steel Chain
- A653/A653M-11 ..... Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated  
(Galvannealed) by the Hot-Dip Process
- A780/A780M-09 ..... Repair of Damages and Uncoated Areas of Hot-Dipped  
Galvanized Coatings.
- 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)
- 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, in any direction.
- C. Railings and Handrails: 200 pounds in any direction at any point.
- D. Manhole Covers: 1200 kg/m<sup>2</sup> (250 pounds per square foot).

### **2.2 MATERIALS**

- A. Structural Steel: ASTM A36.
- B. Stainless Steel: ASTM A167, Type 302 or 304.
- C. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.
- D. Floor Plate:
  - 1. Steel ASTM A786.
  - 2. Aluminum: ASTM B632.
- E. Steel Pipe: ASTM A53.
  - 1. Galvanized for exterior locations.
  - 2. Type S, Grade A unless specified otherwise.
  - 3. NPS (inside diameter) as shown.
- F. Cast-Iron: ASTM A48, Class 30, commercial pattern.
- G. Malleable Iron Castings: ASTM A47.
- H. Primer Paint: As specified in Section 09 91 00, PAINTING.
- I. Stainless Steel Tubing: ASTM A269, type 302 or 304.
- J. 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 A653, 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.

K. Grout: ASTM C1107, pourable type.

## **2.3 HARDWARE**

### **A. Rough Hardware:**

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

### **B. Fasteners:**

1. Bolts with Nuts:
  - a. ASME B18.2.2.
  - b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
  - c. ASTM F468 for nonferrous bolts.
  - d. ASTM F593 for stainless steel.
2. Screws: ASME B18.6.1.
3. Washers: ASTM F436, type to suit material and anchorage.
4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

## **2.4 FABRICATION GENERAL**

### **A. Material**

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

### **B. Size:**

1. Size and thickness of members as shown.

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

C. Connections

1. Except as otherwise specified, connections may be made by welding 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 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 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. Cutting and Fitting:
- a. Accurately cut, machine and fit joints, corners, copes, and miters.
  - b. Fit removable members to be easily removed.
  - c. Design and construct field connections in the most practical place for appearance and ease of installation.
  - d. Fit pieces together as required.
  - e. Fabricate connections for ease of assembly and disassembly without use of special tools.
  - f. Joints firm when assembled.
  - g. Conceal joining, fitting and welding on exposed work as far as practical.
  - h. Do not show rivets and screws prominently on the exposed face.

- i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:

1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
2. Aluminum: NAAMM AMP 501.
  - a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.
  - b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.
  - c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
  - d. Painted: AA-C22R10.
3. Steel and Iron: NAAMM AMP 504.
  - a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
  - b. Surfaces exposed in the finished work:
    - 1) Finish smooth rough surfaces and remove projections.
    - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
  - c. Shop Prime Painting:
    - 1) Surfaces of Ferrous metal:
      - a) Items not specified to have other coatings.
      - b) Galvanized surfaces specified to have prime paint.
      - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
      - d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
      - e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
    - 2) Non ferrous metals: Comply with MAAMM-500 series.
4. Stainless Steel: NAAMM AMP-504 Finish No. 4.
5. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.

G. Protection:



1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

## **2.5 SUPPORTS**

### **A. General:**

1. Fabricate ASTM A36 structural steel shapes as shown.
2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
3. Field connections may be welded or bolted.

### **B. For Wall Mounted Items:**

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

### **C. For Trapeze Bars:**

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

## **2.6 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.

### **B. Frames for Breech Opening:**

1. Fabricate from steel channels, or combination of steel plates and angles to size and contour shown.
2. Weld strap anchors on back of frame at not over 600 mm (2 feet) on centers for concrete or masonry openings.

## **2.7 GUARDS**

### **A. Guard Angles for Overhead Doors:**

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.

### **B. Edge Guard Angles for Openings in slabs.**

1. Fabricate from steel angles of sizes and with anchorage shown.
2. Where size of angle is not shown, provide 50 x 50 x 6 mm (2 x 2 x 1/4 inch) steel angle with 32 x 5 mm (1-1/4 x 3/16 inch) strap anchors, welded to back.
3. Miter or butt angles at corners and weld.
4. Use one anchor near end and three feet on centers between end anchors.

## **2.8 COVERS AND FRAMES FOR PITS AND TRENCHES**

### **A. Fabricate covers to support live loads specified.**

### **B. Galvanized steel members after fabrication in accordance with ASTM A123, G-90 coating.**

### **C. Steel Covers:**

1. Use 6 mm (1/4 inch) thick floor plate for covers unless otherwise shown. Use gratings where shown as specified in paragraph GRATINGS. Use smooth floor plate unless noted otherwise.
2. Provide clearance at all sides to permit easy removal of covers.
3. Make cutouts within 6 mm (1/4 inch) of penetration for passage of pipes and ducts.
4. Drill covers for flat head countersunk screws.

5. Make cover sections not to exceed 2.3 m<sup>2</sup> (25 square feet) in area and 90 kg (200 pounds) in weight.
6. Fabricate trench cover sections not be over 900 mm (3 feet) long and if width of trench is more than 900 mm (3 feet) or over, equip one end of each section with an angle or "T" bar stiffener to support adjoining plate.
7. Use two, 13 mm (1/2 inch) diameter steel bar flush drop handles for each cover section.

#### D. Cast Iron Covers

1. Fabricate covers to support live loads specified.
2. Fabricate from ASTM A48, cast-iron, 13 mm (1/2 inch) minimum metal thickness, cast with stiffeners as required.
3. Fabricate as flush type with frame, reasonably watertight and be equipped with flush type lifting rings. Provide seals where watertight covers noted.
4. Make covers in sections not over 90 kg (200 pounds) except round covers.

#### E. Steel Frames:

1. Form frame from structural steel angles as shown. Where not shown use 63 x 63 x 6 mm (2-1/2 x 2-1/2 x 1/4 inch) angles for frame openings over 1200 mm (4 feet) long and 50 x 50 x 6 mm (2 ix 2 x 1/4 inch) for frame openings less than 1200 mm (4 feet).
2. Fabricate intermediate supporting members from steel "T's" or angles; located to support cover section edges.
3. Where covers are required use steel border bars at frames so that top of cover will be flush with frame and finish floor.
4. Weld steel strap anchors to frame. Space straps not over 600 mm (24 inches) o.c., not shown otherwise between end anchors. Use 6 x 25 x 200 mm (1/4 x 1 x 8 inches) with 50 mm (2 inch) bent ends strap anchors unless shown otherwise.
5. Drill and tap frames for screw anchors where plate covers occur.

#### F. Cast Iron Frames:

1. Fabricate from ASTM A48 cast iron to shape shown.
2. Provide anchors for embedding in concrete, spaced near ends and not over 600 mm (24 inches) apart.

### 2.9 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
  1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate.
- B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve.

- C. Prime bollards with zinc-rich primer.

## **2.10 GRATINGS**

- A. Fabricate gratings as shown.
- B. Provide clearance at all sides to permit easy removal of grating.
- C. Make cutouts in gratings with 6 mm (1/4 inch) minimum to 25 mm (one inch) maximum clearance for penetrations or passage of pipes and ducts. Edge band cutouts.
- D. Fabricate in sections not to exceed 2.3 m<sup>2</sup> (25 square feet) in area and 90 kg (200 pounds) in weight.
- E. Fabricate sections of grating with end-banding bars.
- F. Fabricate angle frames and supports, including anchorage as shown.
  - 1. Fabricate intermediate supporting members from "T's" or angles.
  - 2. Locate intermediate supports to support grating section edges.
  - 3. Fabricate frame to finish flush with top of grating.
  - 4. Locate anchors at ends and not over 600 mm (24 inches) o.c.
  - 5. Butt or miter, and weld angle frame at corners.
- G. Steel Bar Gratings:
  - 1. Fabricate grating using steel bars, frames, supports and other members shown in accordance with Metal Bar Grating Manual.
  - 2. Galvanize steel members after fabrication in accordance with ASTM A123, G-90 for exterior gratings, gratings in concrete floors, and interior grating where specified.
  - 3. Interior gratings: Prime paint unless specified galvanized.
- H. Aluminum Bar Gratings:
  - 1. Fabricate grating and frame assembly from aluminum as shown in accordance with Metal Bar Grating Manual.
  - 2. Use 25 x 5 mm (1 x 3/16 inch) minimum size bearing bars.
  - 3. Mill finish unless specified otherwise.
- I. Plank Gratings:
  - 1. Conform to Fed. Spec. RR-G-1602.
  - 2. Manufacturers standard widths, lengths and side channels to meet live load requirements.
  - 3. Galvanize exterior steel gratings ASTM A123, G-90 after fabrication.
  - 4. Fabricate interior steel gratings from galvanized steel sheet, ASTM A653, where bearing on concrete or masonry.
  - 5. Fabricate other interior grating from steel sheet and finish with shop prime paint. Prime painted galvanized sheet may be used.

J. Cast Iron Gratings:

1. Fabricate gratings to support a live load of 23940 Pa (500 pounds per square foot).
2. Fabricate gratings and frames for gutter type drains from cast-iron conforming to ASTM A48.
3. Fabricate gratings in section not longer than 1200 mm (4 feet) or over 90 kg (200 pounds) and fit so as to be readily removable.

**2.11 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. 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.

**2.12 PLATE DOOR SILL**

- A. Fabricate of checkered plate as detailed.
1. Aluminum Plate: ASTM B632, 3 mm (0.125 inch) thick.
  2. Steel Plate: ASTM A786, 3 mm (0.125 inch thick), galvanized G90.
- B. Fabricate for anchorage with flat head countersunk bolts at each end and not over 300 mm (12 inches), o.c.

**2.13 SAFETY NOSINGS**

- A. Fed. Spec. RR-T-650, Type C.
1. Aluminum: Class 2, Style 2.
- B. Fabricate nosings for exterior use from cast aluminum with an integral-abrasive, as-cast finish. Use one Class throughout.
- C. Fabricate nosings approximately 100 mm (4 inches) wide with not more than 9 mm (3/8 inch) nose.

- D. Provide nosings with integral type anchors spaced not more than 100 mm (4 inches) from each end and intermediate anchors spaced approximately 375 mm (15 inches) on center.
- E. Fabricate nosings to extend within 100 mm (4 inches) of ends of concrete stair treads except where shown to extend full width.

## **2.14 LADDERS**

### **A. Steel Ladders:**

- 1. Comply with ANSI A14.3 unless otherwise indicated.
- 2. Comply with ASME A17.1 for elevator pit ladders.
- 3. Space siderails 16 inches apart unless otherwise indicated.
- 4. Siderails: Continuous 1/8 inch by 1-1/2 inch steel flat bars with eased edges.
- 5. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.
- 6. 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.
- 7. Provide holes for anchoring with expansion bolts through turned ends and brackets.
- 8. Where shown, fabricate side rails curved, twisted and formed into a gooseneck.
- 9. Galvanize exterior ladders and elevator pit ladders after fabrication, ASTM A123, G-90.
- 10. Rungs: 20mm (3/4-inch) diameter steel bars.
- 11. Fit Rungs in center lines of siderails; plug weld and grind smooth on outer rail faces.
- 12. Space rungs 12 inches (on center) apart, with a lowest rung 12 inches above finish floor to the top of the rung.
- 13. Provide an abrasive surface on top part of rung.

## **2.15 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 (core drilling of concrete to install railings will be acceptable at exterior locations only.)
  - b. Only at locations where inserts interfere with reinforcing bars, provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.

6. Interior Post Anchors:

- a. Provide steel weld plates set into concrete for securing fixed posts to floor with welded connections, unless shown otherwise.
- b. Weld to posts at base.

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 1200 mm (4 feet) on centers between end posts.
4. Form handrail brackets from malleable iron.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

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

### **3.2 INSTALLATION OF SUPPORTS**

- A. Anchorage to structure.
  - 1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
  - 2. Secure steel plate or hat channels to studs as detailed.
- B. Supports for Wall Mounted items:
  - 1. Locate center of support at anchorage point of supported item.
  - 2. Locate support at top and bottom of wall hung cabinets.
  - 3. Locate support at top of floor cabinets and shelving installed against walls.
  - 4. Locate supports where required for items shown.
- C. Support for cantilever grab bars:
  - 1. Locate channels or tube in partition for support as shown, and extend full height from floor to underside of structural slab above.
  - 2. Anchor at top and bottom with angle clips bolted to channels or tube with two, 9 mm (3/8 inch) diameter bolts.
  - 3. Anchor to floors and overhead construction with two 9 mm (3/8 inch) diameter bolts.
  - 4. Fasten clips to concrete with expansion bolts, and to steel with machine bolts or welds.
- D. Supports for Trapeze Bars:
  - 1. Secure plates to overhead construction with fasteners as shown.
  - 2. Secure angle brace assembly to overhead construction with fasteners as shown and bolt plate to braces.
  - 3. Fit modular channel unit flush with finish ceiling, and secure to plate with modular channel unit manufacturer's standard fittings through steel shims or spreaders as shown.
    - a. Install closure plates in channel between eye bolts.
    - b. Install eyebolts in channel.

### **3.3 COVERS AND FRAMES FOR PITS AND TRENCHES**

- A. Set frame and cover flush with finish floor.
- B. Secure plates to frame with flat head countersunk screws.
- C. Set gratings loose in drainage trenches or over pits unless shown anchored.

### **3.4 DOOR FRAMES**

- A. Secure clip angles at bottom of frames to concrete slab with expansion bolts as shown.
- B. Level and plumb frame; brace in position required.
- C. At masonry, set frames in walls so anchors are built-in as the work progresses unless shown otherwise.



- D. Set frames in formwork for frames cast into concrete.
- E. Where frames are set in prepared openings, bolt to wall with spacers and expansion bolts.

### **3.5 OTHER FRAMES**

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

### **3.6 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.
- B. Channel Guard at Top Edge of Concrete Platforms:
  - 1. Install in formwork before concrete is placed.
  - 2. Set channel flush with top of the platform.

### **3.7 GRATINGS**

- A. Set grating flush with finish floor; top of curb, or areaway wall. Set frame so that horizontal leg of angle frame is flush with face of wall except when frame is installed on face of wall.
- B. Set frame in formwork before concrete is placed.
- C. Where grating terminates at a wall bolt frame to concrete or masonry with expansion bolts unless shown otherwise.
- D. Secure removable supporting members in place with stainless steel bolts.
- E. Bolt gratings to supports.

### **3.8 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.

### **3.9 PLATE DOOR SILL**

- A. Install after roofing base flashing and counter flashing work is completed.
- B. Set in sealant and bolt to curb.

### **3.10 SAFETY NOSINGS**

- A. Except as specified and where preformed rubber treads are shown or specified install safety nosings at the following:

1. Exterior concrete steps.
- B. Install flush with horizontal and vertical surfaces.
- C. Install nosing to within 100 mm (4 inches) of ends of concrete stair treads, except where shown to extend full width.

### **3.11 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.

### **3.12 RAILINGS**

- A. Steel Posts:
  1. Secure fixed posts to concrete with sleeves with pourable grout at exterior locations and welded steel weld plates set in concrete at interior locations..
  2. Install sleeves in concrete formwork.
  3. Set post in sleeve and pour grout to surface. Apply beveled bead of urethane sealant at perimeter of post or under flange fitting as specified in Section 07 92 00, JOINT SEALANTS on exterior posts.
  4. Secure posts to steel with welds.
- B. Anchor to Walls:
  1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.
    - a. Anchor steel plate to concrete or solid masonry with expansion bolts.
    - b. Anchor steel plate to hollow masonry with toggle bolts.
  2. Anchor flanged fitting with toggle bolt to steel support in frame walls.
- C. Handrails:
  1. Anchor brackets for metal handrails. Use type of brackets with flange tapped for concealed anchorage to threaded hanger bolt at walls. Weld brackets to guardrails that are adjacent to hand rails.
  2. Install brackets within 300 mm (12 inches) of return of walls, and at evenly spaced intermediate points not exceeding 1200 mm (4 feet) on centers unless shown otherwise.
  3. Expansion bolt to concrete or solid masonry (concealed anchor head).

4. Toggle bolt to hollow masonry unless shown otherwise (concealed anchor head).
5. Lag bolt to fire retardant blocking between studs of steel framed partitions (concealed anchor head).

### **3.13 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.
- C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

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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.

**1.2 RELATED WORK**

- A. Concrete fill for treads and platforms: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Wall handrails and railings for other than steel stairs: Section 05 50 00, METAL FABRICATIONS.
- C. Stair treads: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- D. Rubber floor tile: Section 09 65 19, RESILIENT TILE FLOORING.
- E. 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: Include plans, elevations, sections, details, and attachments to other work.
- C. Product Data: For metal stairs.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.5 QUALITY ASSURANCE**

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Preassembled Stairs: Commercial class.

## **1.6 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
  - A563-07 .....Carbon and Alloy Steel Nuts
  - A653/653M-07.....Steel Sheet, Zinc Coated (Galvanized) or Zinc Alloy Coated (Galvannealed) by the Hot-Dip Process
  - A786/A786M-00.....Rolled Steel Floor Plates
  - A1008-07 .....Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low-Alloy
  - 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:
- 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. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
  2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
  3. Uniform and concentrated loads need not be assumed to act concurrently.
  4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
  5. Limit deflection of treads, platforms, and framing members to  $L/240$  or 1/4 inch (6.4 mm), whichever is less.
- C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
    - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  2. Infill of Guards:
    - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
    - b. Infill load and other loads need not be assumed to act concurrently.

## **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 A786.
- F. Steel Decking: Form from zinc coated steel conforming to ASTM A653, with properties conforming to AISI Specification for the Design of Cold-Formed Steel Structural Members.
- G. Steel Plate: ASTM A1011.
- H. Iron Castings: ASTM A48, Class 30.
- I. Malleable Iron Castings: ASTM A47.

## **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 and guardrails, from steel pipe.
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 four feet on center between end post or newel 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 as noted on Drawings.
- C. Form risers with sanitary cove.
- D. Fabricate stringers, headers, and other supporting members from structural steel.
- E. Construct newel posts of steel tubing having wall thickness not less than 5 mm (3/16-inch), with forged steel caps and drops.

## **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 required.
- 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, sub-flooring, rough hardware, and light wood construction.

**1.2 RELATED WORK:**

- A. Gypsum sheathing: Section 09 29 00, GYPSUM BOARD.
- B. Gypsum board 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 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**1.5 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.

**1.6 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
  - 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. Green Globes™ Requirements:
  - 1. All solid lumber and timber panel products shall be approved by the CSA (Canadian Standards Association), the FSC (Forestry Stewardship Council), the Sustainable Forestry Initiative (SFI), or the American Tree Farm System (ATFS). Tropical hardwoods shall not be used.
- B. 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.
- C. Lumber Other Than Structural:
  - 1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
  - 2. Furring, blocking, nailers and similar items 100 mm (4 inches) and narrower Standard Grade; and, members 150 mm (6 inches) and wider, Number 2 Grade.
- D. 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.
- E. 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.
- F. Fire Retardant Treatment:
1. Treat all lumber products.
  2. Mil Spec. MIL-L-19140 with piece of treated material bearing identification of testing agency and showing performance rating.
  3. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.
  4. Fire-retardant treat by pressure process. Provide a flame index of 25 or less when tested according to ASTM E84.
- G. 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. Equipment Backing Panels:
1. APA rated Exposure 1 or Exterior; panel grade CD or better.
  2. Minimum 19 mm (3/4 inch) thick with supports with supports 600 mm (24 inches) on center unless specified otherwise.

## **2.3 ROUGH HARDWARE AND ADHESIVES:**

- A. Where rough carpentry is exposed to weather, in ground contact, pressure preservative treated, or in area of high relative humidity, provide fasteners with hot dip zinc coating complying with ASTM A153/A153M or of type 304 stainless steel as recommended by fastener manufacturer for corrosion resistance of fastener from material being fastened.
- B. 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).
- C. 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.
- D. Washers
  - 1. ASTM F844.
  - 2. Use zinc or cadmium coated steel or cast iron for washers exposed to weather.
- E. Screws:
  - 1. Wood to Wood: ANSI B18.6.1 or ASTM C1002.
  - 2. Wood to Steel: ASTM C954, or ASTM C1002.
- F. 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. Masonry: Type I, Style 27.
    - e. 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 GENERAL**

- A. Where pressure treated lumber or panel products are installed adjacent to metal decking, install a continuous flexible flashing separator between wood and metal.

- b. Comply with AWP M4 for applying field treatment to cut surfaces of treated lumber and panel products.

### **3.2 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:**

#### **A. Conform to applicable requirements of the following:**

- 1. APA for installation of plywood or structural use panels.

#### **B. Fasteners:**

##### **1. Nails.**

- a. 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.
- b. Use 16 penny or larger nails for nailing through 50 mm (2 inch) thick lumber.

##### **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. Blocking, Nailers and Furring:

1. Install blocking and nailers where shown or if not shown, as required for a complete and secure installation.
2. Use longest lengths practicable.
3. Use fire retardant treated wood blocking at all locations.
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.

N. Equipment Backing Panels:

1. Use plywood panels for equipment backing panels.
2. Use fire retardant treated plywood at all locations.
3. Use largest panel sized practicable.
4. Install panels with long sides vertical unless otherwise directed by Resident Engineer.
5. Install plywood backing panels by fastening to framing; coordinate location with utilities and services requiring backing panels.

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**SECTION 061600  
FLEXIBLE FLASHING**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Flexible flashing at openings in Exterior Wall Construction.

**1.2 RELATED WORK**

- A. Section 06 10 00, ROUGH CARPENTRY.
- B. Section 07 40 00, ROOFING AND SIDING PANELS
- C. Section 07 41 50, COMPOSITE METAL BUILDING PANELS
- D. Section 07 60 00, FLASHING AND SHEET METAL
- E. Section 07 92 00, JOINT SEALANTS
- F. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES
- G. Section 08 33 13, COILING COUNTER DOORS
- H. Section 08 41 13, ALUMINUM FRAMED ENTRANCES AND STOREFRONTS
- I. Section 08 44 13, FLAZED ALUMINUM CURTAIN WALLS
- J. Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.



## **1.5 QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

## **PART 2 – PRODUCTS**

### **2.1 FLEXIBLE FLASHINGS**

- A. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Coordinate installation of flashing and joint-sealant installation so that exterior wall construction materials are installed in sequence and manner that exclude exterior moisture.
- B. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

### **3.2 FLEXIBLE FLASHING INSTALLATION**

- A. Apply flexible flashing to comply with manufacturers written instructions.
  - 1. Lap seams and junctures with other materials at least 4 inches (100 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
  - 2. After flashing has been applied, roll surfaces with a hard rubber or metal roller.

### **3.3 PROTECTION**

- A. Flexible Flashing: Do not allow flexible flashing to be exposed beyond the time recommended by flexible flashing manufacturer. Protect according to manufacturer's written instructions.

- - - END - - -

**SECTION 064116**  
**PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Plastic-laminate-faced architectural cabinets.
  - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

**1.2 RELATED WORK**

- A. Framing, Furring and Blocking: Section 06 10 00, ROUGH CARPENTRY.
- B. Color and Texture of Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Solid Surface Countertops: Section 12 36 61, SIMULATED STONE COUNTERTOPS.
- D. Stock Casework: Section 12 56 70, INTEGRATED MODULAR MEDICAL SUPPORT SYSTEM.

**1.3 ACTION SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, fire-retardant-treated materials and cabinet hardware and accessories.
- C. Golden Globes Submittals:
  - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- D. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components. Show constructional and installation details.
  - 1. Provide half-full size scale for sections and details, 1/4-inch equals one foot scale (minimum) for elevations and plans.
- E. Samples:
  - 1. Plastic laminates, for each color, pattern, and surface finish.
  - 2. Thermoset decorative panels, for each color, pattern, and surface finish.

- F. Certificates:
  - 1. Indicating preservative treatment and fire retardant treatment of materials meet the requirements specified.
  - 2. Indicating moisture content of materials meet the requirements specified.
- G. List of acceptable sealers for fire retardant and preservative treated materials.
- H. Manufacturer's literature and data:
  - 1. Finish hardware
  - 2. Sinks with fittings
  - 3. Electrical components

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

#### **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Protect lumber and millwork from dampness, maintaining moisture content specified both during and after delivery at site.
- B. Store finishing lumber and millwork in weathertight well ventilated structures or in space in existing buildings designated by Resident Engineer. Store at a minimum temperature of 210C (700F) for not less than 10 days before installation.

#### **1.7 QUALITY ASSURANCE**

- A. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products and Certified participant in AWI's Quality Certification Program.

- C. Quality Standards: Unless noted otherwise, comply with AWI's "Architectural Woodwork Quality Standards: premium grade materials and installation.

## **1.8 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Testing and Materials (ASTM):
- |                 |  |
|-----------------|--|
| A167-99 (R2004) | Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip |
| B26/B26M-05     | Aluminum-Alloy Sand Castings   |
| B221-06         | Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes |
| E84-07          | Surface Burning Characteristics of Building Materials                      |
| F436-07         | Hardened Steel Washers   |
- C. Builders Hardware Manufacturers Association (BHMA):
- |            |                    |
|------------|--------------------|
| A156.9-03  | Cabinet Hardware   |
| A156.11-04 | Cabinet Locks      |
| A156.16-02 | Auxiliary Hardware |
- D. Hardwood Plywood and Veneer Association (HPVA):
- |        |                                 |
|--------|---------------------------------|
| HP1-04 | Hardwood and Decorative Plywood |
|--------|---------------------------------|
- E. National Particleboard Association (NPA):
- |           |                    |
|-----------|--------------------|
| A208.1-99 | Wood Particleboard |
|-----------|--------------------|
- F. American Society of Mechanical Engineers (ASME):
- |                   |   |
|-------------------|---|
| B18.2.1-96(R2005) | Square and Hex Bolts and Screws (Inch Series) |
|-------------------|---|
- 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  |
| LD 3.1-95 | Application, Fabrication and Installation of High-Pressure Decorative Laminates |
- J. U.S. Department of Commerce, Product Standard (PS):

- |    |                                      |  |
|----|--------------------------------------|--|
|    | PS1-95                               | Construction and Industrial Plywood        |
|    | 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                           |

## **1.9 FIELD CONDITIONS**

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

## **PART 2 - PRODUCTS**

### **2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS**

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
  - 1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
- B. Grade: Premium.
- C. Regional Materials: Plastic-laminate cabinets shall be manufactured within 500 miles (800 km) of Project site.
- D. Certified Wood: Plastic-laminate cabinets shall be made from wood products certified as "FSC Pure or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- E. Type of Construction: Frameless.
- F. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

- H. Laminate Cladding for Exposed Surfaces:
  - 1. Horizontal Decorative Surfaces including both sides of cabinet doors, and for items having plastic laminate finish: Grade HGL.
  - 2. Postformed Surfaces: Grade HGP.
  - 3. Backing Sheet on bottom of plastic laminate covered wood tops: Grade HGP
  - 4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- I. Materials for Semiexposed Cabinet Interior Surfaces Including Shelving:
  - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade CLS or Thermoset decorative panels.
  - 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
  - 3. Drawer Bottoms: Thermoset decorative panels.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
  - 1. As selected by Resident Engineer from laminate and thermoset decorative panel manufacturer's full ranges.
  - 2. See Section 09 06 00, SCHEDULE FOR FINISHES.

## **2.2 WOOD MATERIALS**

- A. Wood Lumber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Wood Moisture Content: Kiln Dried to 5 to 10 percent.
  - 2. Grading and Marking:
    - a. Lumber shall bear the grade mark, stamp, or other identifying marks indicating grades of material.
    - b. 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.
    - c. The inspection agency for lumber shall be approved by the Board of Review, American Lumber Standards Committee, to grade species used.

3. Sizes:
    - a. 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.
    - b. Millwork, standing and running trim, and rails: Actual size as shown or specified.
  4. Hardwood: MM-L-736, species as specified for each item.
  5. Softwood: PS-20, exposed to view appearance grades:
    - a. Use C select or D select, vertical grain for transparent finish including stain transparent finish.
    - b. Use Prime for painted or opaque finish.
  6. Use edge grain Wood members exposed to weather.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Recycled Content of Medium-Density Fiberboard and Particleboard:  
Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
  2. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
  3. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
  4. Softwood Plywood:
    - a. Prod. Std.
    - b. Grading and Marking:
      - 1) 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.
      - 2) The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PS1.

- c. 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.
  - d. Plastic Laminate Plywood Cores:
    - 1) Exterior Type, and species group.
    - 2) Veneer Grade: A-C.
  - e. Shelving Plywood:
    - 1) Interior Type, any species group.
    - 2) Veneer Grade: A-B or B-C.
  - f. Other: As specified for item.
5. Hardwood Plywood:
- a. HPVA: HP.1, made with adhesive containing no urea formaldehyde.
  - b. Species of face veneer shall be as shown or as specified in connection with each particular item.
  - c. Inside of Building:
    - 1) Use Type II (interior) A grade veneer for transparent finish.
    - 2) Use Type II (interior) Sound Grade veneer for paint finish.
  - d. On Outside of Building:
    - 1) Use Type I, (exterior) A Grade veneer for natural or stained and varnish finish.
    - 2) Use Type I, (exterior) Sound Grade veneer for paint finish.
  - e. Use plain sliced red oak // rotary cut white birch // unless specified otherwise.
6. 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, made with adhesive containing no urea formaldehyde.
    - 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.
7. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and



complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

## **2.3 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.

## **2.4 FIRE-RETARDANT-TREATED MATERIALS**

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated,. The Treatment shall be in accordance with Mil. Spec. MIL-L19140. Use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
  - 1. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- 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, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
    - 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.

- G. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

## **2.5 PRESERVATIVE TREATMENT**

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

## **2.6 STAINLESS STEEL**

ASTM A167, Type 302 or 304.

## **2.7 ALUMINUM CAST**

ASTM B26

## **2.8 ALUMINUM EXTRUDED**

ASTM B221

## **2.9 CABINET HARDWARE AND ACCESSORIES**

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. 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.
- C. 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.
- 3. Auxiliary Hardware: ANSI A156.16.
  - a. Door and Drawer Silencers: L03011
- 4. Edge Strips Moldings:
  - a. Driven type "T" shape with serrated retaining stem; vinyl plastic to match plastic laminate color, stainless steel, or 3 mm (1/8 inch) thick extruded aluminum.
  - b. Stainless steel or extruded aluminum channels.
  - c. Stainless steel, number 4 finish; aluminum, mechanical applied medium satin finish, clear anodized 0.1 mm (0.4 mils) thick.
- 5. Rubber or Vinyl molding
  - a. Rubber or vinyl standard stock and in longest lengths practicable.
  - b. Design for closures at joints with walls and adhesive anchorage.
  - c. Adhesive as recommended by molding manufacturer.
- D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. As selected by Resident Engineer from Hardware Manufacturer's full range.
  - 2. See Section 09 06 00, SCHEDULE FOR FINISHES.

## **2.10 MISCELLANEOUS MATERIALS**

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

## **2.11 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. Plywood shall be not less than 13 mm (1/2 inch), unless otherwise shown or specified.
4. Edges of members in contact with concrete or masonry shall have a square corner caulking rebate.
5. Fabricate members less than 4 m (14 feet) in length from one piece of lumber, back channeled and molded as shown.
6. Interior items of millwork to be painted may be fabricated from jointed, built-up, or laminated members, unless otherwise shown on drawings or specified.
7. 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 and vanity tops, including back splashes and end splashes of countertops.
  - d. Use backing sheet on concealed large panel surface when decorative face does not occur.

### **B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.**

### **C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.**

D. Counter or Work Tops:

1. Refer to Specification Section 12 36 61, SIMULATED STONE COUNTERTOPS.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Maintain work areas and storage areas to a minimum temperature of 210C (700F) for not less than 10 days before and during installation of interior millwork.
- C. 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.
- D. Examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

### **3.2 INSTALLATION**

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for a complete installation. Use fine finishing nails[ or finishing screws] for exposed fastening, countersunk and filled flush with woodwork and matching finish. Anchor millwork firmly to walls with no visible fasteners..
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood, blocking, or hanging strips, No. 10 wafer-head sheet metal screws through metal backing or metal framing

behind wall finish or toggle bolts through metal backing or metal framing behind wall finish. Use fasteners as appropriate for specific condition experiences.

- F. Seal edges of preservative and fire retardant treated wood material with a certified acceptable sealer.
- G. Set no millwork until priming and back-painting has occurred on concealed surfaces.
- H. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.

- - - E N D - - -

**SECTION 066400  
PLASTIC PANELING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes plastic sheet paneling.

**1.2 RELATED SECTIONS**

- A. Section 092216 – Non-Structural Metal Framing
- B. Section 092900 – Gypsum Board.
- C. Section 096513 - Resilient Base and Accessories.
- D. Section 099100 - Painting.

**1.3 REFERENCES**

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
  - 1. ASTM D 256 -- Izod Impact Strengths (ft #/in)
  - 2. ASTM D 570 - -Water Absorption (%)
  - 3. ASTM D 638 - -Tensile Strengths (psi) & Tensile Modulus (psi)
  - 4. ASTM D 790 - -Flexural Strengths (psi) & Flexural Modulus (psi)
  - 5. ASTM D 2583- Barcol Hardness
  - 6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
  - 7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Submit manufacturer's full line of color pattern selection samples representing manufacturer's full range of colors and patterns.
- B. Samples: For plastic paneling and trim accessories.
- C. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- D. Manufacturers Material Safety Data Sheets (MSDS) for adhesives and sealants prior to their delivery to the site.

**1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the

health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.6 QUALITY ASSURANCE**

- A. Testing Agency: Acceptable to authorities having jurisdiction.
- B. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
  1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
    - a. Wall Required Rating – Class A.

#### **1.7 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials factory packaged on strong pallets.
- B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70°) for 48 hours prior to installation.

#### **1.8 PROJECT CONDITIONS**

- A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work
- B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
  1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

#### **1.9 WARRANTY**

- A. Furnish one year guarantee against defects in material and workmanship.



## **PART 2 - PRODUCTS**

### **2.1 PLASTIC SHEET PANELING**

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319.
- B. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
  - 1. Coating: Multi layer print, primer and finish coats.
  - 2. Dimensions:
    - a. Thickness – 0.090 inch (2.29mm) nominal
    - b. Width - 4'-0" (1.22m) nominal
    - c. Length – 10'-0" (3.0m) nominal
  - 3. Tolerance:
    - a. Length and Width: +/-1/8 inch (3.175mm)
    - b. Square - Not to exceed 1/8 inch for 8 foot (2.4m) panels or 5/32 inch (3.96mm) for 10 foot (2.4m) panels
- C. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
  - 1. Flexural Strength -  $1.0 \times 10^4$  psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
  - 2. Flexural Modulus -  $3.1 \times 10^5$  psi per ASTM D 790. (217.9 kilogram-force/square millimeter)
  - 3. Tensile Strength -  $7.0 \times 10^3$  psi per ASTM D 638. (4.9 kilogram-force/square millimeter)
  - 4. Tensile Modulus -  $1.6 \times 10^5$  psi per ASTM D 638. (112.5 kilogram-force/square millimeter)
  - 5. Water Absorption - 0.72% per ASTM D 570.
  - 6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
  - 7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256
- D. Back Surface: Smooth.
- E. Front Finish: In accordance with sample selected and approved by the Resident Engineer.
  - 1. Color: As selected from manufacturer's full line of colors and approved by the Resident Engineer.
  - 2. Surface As selected and approved by the Resident Engineer.
  - 3. Fire Rating Class A(I)

- 4. Size: 4' x 10' (1.2m x 3m) x .120"
- F. Low-Emitting Materials: Paneling shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 450 or less.

## **2.2 ACCESSORIES**

- A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners,[ outside corners,] and caps as needed to conceal edges.
  - 1. Color: Match panels.
- B. Adhesive: Construction adhesives complying with ASTM C 557.
  - 1. Water- resistant, non-flammable adhesive
- C. Adhesive: As recommended by plastic paneling manufacturer and with a VOC content of [50] <Insert value> g/L or less.
- D. Adhesive: As recommended by plastic paneling manufacturer and that complies with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
  - 1. Verify that stud spacing does not exceed 24 inch (61cm) on-center.
- B. Repair defects prior to installation.
  - 1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

- C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels and so that trimmed panels at corners are not less than 12 inches (300 mm) wide.

### **3.2 INSTALLATION**

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install trim accessories with adhesive
- D. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- E. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains. Do not use abrasive cleaners.

- - - 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 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill

these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.5 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).

#### **1.6 ENVIRONMENTAL REQUIREMENTS:**

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

#### **1.7 WARRANTY:**

Warrant bituminous sheet waterproofing installation against moisture leaks and subject to terms of "Warranty of Construction", Article in Section 007200 - GENERAL CONDITIONS, except that warranty period is two years.

#### **1.8 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - C578-07 .....Rigid Cellular Polystyrene Thermal Insulation
  - D41-05 .....Asphalt Primer Used in Roofing, Dampproofing and  
Waterproofing
  - D4586-07 .....Asphalt Roof Cement (Asbestos Free)
  - D6135-05 .....Application of Self-Adhering Modified Bituminous  
Waterproofing
  - D6380-03 .....Asphalt Roll Roofing (Organic Felt)

#### **1.9 PRE-INSTALLATION MEETINGS**

- A. Pre-Installation Conference: Conduct conference at the Project Site.

## **PART 2 - PRODUCTS**

### **2.1 BITUMINOUS SHEET:**

- A. Self-adhering, cold applied waterproofing membrane composed primarily of modified bituminous material prefabricated in sheet form designed for below grade exterior and split slab waterproofing. Sheet reinforced with fibers at manufacturer's option.
- B. Thickness of Bituminous Sheet: 1.5 mm (60 mils), plus or minus 0.13 mm (5 mils), and bonded to a 0.1 mm (4 mil) thick plastic sheet.
- C. Provide with a release sheet to prevent bonding of bituminous sheet to itself.
- D. Physical Properties:
  - 1. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
  - 2. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
  - 3. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
  - 4. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
  - 5. Puncture Resistance: 40 lbf minimum; ASTM E 154.
  - 6. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.
  - 7. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
  - 8. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

### **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 SURFACE CONDITIONS**

- A. Liquid, waterborne surface conditioner recommended for substrate by sheet waterproofing material manufacturer.

### **2.4 PROTECTION MATERIAL:**

- A. Polystyrene: ASTM C578, Type I, 25 mm (1-inch) minimum thickness.
- B. 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>).

### **2.5 PATCHING COMPOUND:**

A factory prepared, non-shrinking, fast setting, cementitious adhesive compound containing no ferrous metal or oxide.

## **2.6 CONCEALED SHEET STRIPS:**

- A. Self-adhering, reinforced, rubberized asphalt strips of same material and thickness as sheet waterproofing

## **2.7 MASTIC, ADHESIVES, AND TAPE**

- A. Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

## **2.8 MOLDED-SHEET DRAINAGE PANELS**

- A. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panels consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a woven-geotextile facing with an apparent opening size not exceeding No. 40 (0.425-mm) sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a horizontal flow rate not less than 2.8 gpm per ft. (35 L/min. per m).

## **PART 3 - EXECUTION**

### **3.1 PREPARATION:**

- A. Surface Condition:
  - 1. Prepare surfaces according to waterproofing manufacturer's written instructions and recommendations in ASTM D6135.
  - 2. 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.
  - 3. 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. Install according to waterproofing manufacturer's written instruction and recommendations in ASTM D6135.
- B. 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.
- C. 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.
8. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) minimum beyond repaired areas in all directions.

D. 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.

E. Projection Treatment:

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

### **3.3 PROTECTION:**

- A. Protect bituminous sheet before backfill or wearing courses are placed.
- B. Install protection material and hold in place in accordance with instructions of manufacturer of waterproofing materials.
- C. Permanent Protection:
  1. Vertical Surfaces:
    - a. Install 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.
- D. Horizontal Surfaces:
  1. Install roll roofing protection under concrete wearing courses.



2. Install roll roofing, 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.

**3.7 PROTECTION, REPAIR, AND CLEANING**

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

--- E N D ---

**SECTION 07 19 00**  
**UNDER-SLAB VAPOR RETARDER**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Products Supplied Under This Section
  - 1. Vapor Retarder, seam tape, pipe boots, detail strip for installation under concrete slabs.

**1.2 RELATED SECTIONS**

- A. Section 03 30 00, CAST-IN-PLACE CONCRETE

**1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM E 1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
  - 2. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
  - 3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
  - 4. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
  - 5. ASTM E 1643-09 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- B. American Concrete Institute (ACI):
  - 1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

**1.4 SUBMITTALS**

- A. Quality Control / Assurance
  - 1. Independent laboratory test results showing compliance with ASTM & ACI Standards.
  - 2. Manufacturer's samples, literature and product data.
  - 3. Manufacturer's installation instructions for placement, seaming and pipe boot installation.

**1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to

establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.6 QUALITY ASSURANCE**

- A. In order to ensure compatibility, all vapor retarder, seam tape, pipe boots, detail strips, etc., require for a complete installation will be obtained from one single manufacturer. At no time will products or accessories from multiple manufacturer's be used.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean dry area in accordance with manufacturer's instructions.
- C. Stack membrane on smooth ground or wood platform to eliminate warping.
- D. Protect materials during handling and application to prevent damage or contamination.
- E. Ensure membrane is stamped with manufacturer's name, product name and membrane thickness at intervals of no more than 85" (220 cm).

## **1.8 ENVIRONMENTAL REQUIREMENTS**

- A. Product not intended for uses subject to abuse or permanent exposure to the elements.
- B. Do not apply on frozen ground.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Vapor Retarder Performance: Vapor Retarder below placed concrete must have all of the following qualities:
  1. Permeance as tested before and after mandatory conditioning (ASTM E 1745 Section 7.1 and sub-paragraphs 7.1.1 - 7.1.5): less than 0.01 Perms (grains/(ft<sup>2</sup> · hr · inHg)).

2. Other performance criteria:
  - a. Water Vapor Transmission Rate ASTM F1249 calibrated to ASTM E96 (water method): 0.1012 grains/ft<sup>2</sup>/hour.
  - b. Resistance to organisms and substrates in contact with soil ASTM E154, Section 13: 0.051 perms.
  - c. Tensile Strength: ASTM E 1745 Class A – 52.0 lbf/in.
  - d. Puncture Resistance: ASTM E 1745-09, Class A – 3770 g (no inch-pound equivalent used)
  - e. Water Vapor Retarder ASTM E1745: Meets or exceeds Class A, B and C.
  - f. Thickness of Retarder: Not less than 10 Mils

## **2.2 ACCESSORIES**

- A. Seam Tape
  1. High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width as required by the Manufacturer to ensure appropriate seal of 4-inches, whichever is greater.
- B. Pipe Boots
  1. Construct pipe boots from vapor barrier material and pressure sensitive tape, as required per manufacturer's written instructions.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Examine surfaces to receive membrane. DO not begin surface preparation or application until unacceptable conditions have been corrected.
- B. Ensure that subsoil is approved by Resident Engineer
  1. Level and tamp or roll aggregate, sand or tamped earth base.
  2. Prepare surfaces in accordance with manufacturer's written instruction.

### **3.2 INSTALLATION**

- A. Install Vapor Retarder:
  1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-09.
    - a. Unroll Vapor Retarder with the longest dimension parallel with the direction of the pour.
    - b. Lap Vapor Retarder over footings and seal to foundation walls.
    - c. Overlap joints 6 inches and seal with manufacturer's tape.

- d. Seal all penetrations (including pipes) with manufacturer's pipe boot.
- e. No penetration of the vapor Retarder is allowed except for reinforcing steel and permanent utilities.
- f. Repair damaged areas by cutting patches of vapor Retarder, overlapping damaged area 6 inches and taping all four sides with tape.
- g. Install under entire slab-on-grade floor area.

- - - E N D - - -

**SECTION 07 21 13**  
**THERMAL INSULATION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 RELATED WORK**

- A. Insulation for insulated wall panels: Section 07 40 00, ROOFING AND SIDING PANELS.
- B. Insulation in connection with roofing and waterproofing: Section 07 22 00, ROOF AND DECK INSULATION.
- C. Safing insulation: Section 07 84 00, FIRESTOPPING.

**1.3 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

- 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**1.4 GREEN GLOBE REQUIREMENTS**

- A. Building Envelope
  - 1. Insulation shall be optimized to minimize heat losses or heat gains through the building envelope.
  - 2. Glazing with a low U-factor shall be used, taking into consideration the building function, orientation, and the climate. Document targeted U-values for the walls and roof. Minimum requirements are to meet the Federal Building Energy Codes.
  - 3. The integrity of the building envelope shall be assured using air/vapor barrier best practices. Materials to be used shall meet or exceed the ASHRAE 90.1-2004 or State Energy Building Codes standards with respect to thermal resistance and maintaining interior comfort.
  - 4. Materials, insulation, and sealing strategies shall be used to prevent groundwater or driven rain from penetrating the building.

5. A systematic approach shall be used to provide a continuity of an air barrier, including areas where dissimilar materials meet.
- B. The building form and thermal massing shall be used to minimize heat loss through the building envelope

#### **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. 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.

#### **1.6 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.

#### **1.7 APPLICABLE PUBLICATIONS:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 

|               |   |
|---------------|---|
| 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 Polyisocyanurate 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 |
| C1149.....          | Self-Supported Spray Applied Cellulosic Thermal Insulation  |
| 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                        |
|-------------------------------|--|
| Perlite composite board       | 23 percent post consumer recovered paper |
| Polyisocyanurate/polyurethane |  |
| Rigid foam                    | 9 percent recovered material             |
| Glass fiber reinforced        | 6 percent recovered material             |
| Phenolic rigid foam           | 5 percent recovered material             |
| Rock wool material            | 75 percent recovered material            |

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

### **2.2 MASONRY CAVITY WALL INSULATION:**

- A. Mineral Fiber Board: ASTM C612, Type II, faced with a vapor retarder having a perm rating of not more than 0.5.
- B. Polyurethane or Polyisocyanurate Board: ASTM C591, Type I, faced with a vapor retarder having a perm rating of not more than 0.5.
- C. Polystyrene Board: ASTM C578, Type X.
- D. Perlite Board: ASTM C728.



- E. Cellular Glass Block: ASTM C552, Type I or IV.

### **2.3 PERIMETER INSULATION IN CONTACT WITH SOIL:**

- A. Polystyrene Board: ASTM C578, Type IV, V, VI, VII, or IX where covered by soil or concrete.
- B. Cellular Glass Block: ASTM C552, Type I or IV.

### **2.4 EXTERIOR FRAMING OR FURRING INSULATION:**

- A. Self-Supported, Spray-Applied, Cellulosic Insulation: ASTM C1149, Type I Materials applied with liquid adhesive; suitable for either exposed or enclosed application), Chemically treated for flame-resistance processing, and handling characteristics. Provide support and containment mesh at locations where insulation does not abut an adjacent surface.

### **2.5 ACOUSTICAL INSULATION:**

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

### **2.6 RIGID INSULATION:**

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

### **2.7 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.

### **2.8 ADHESIVE:**

- A. As recommended by the manufacturer of the insulation.
- B. Asphalt: ASTM D312, Type III or IV.

### **2.9 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.
- E. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

### **3.2 MASONRY CAVITY WALLS:**

- A. Mount insulation on exterior faces of inner wythes of masonry cavity walls and brick faced concrete walls. Fill joints with same material used for bonding.
- B. Bond polystyrene board to surfaces with adhesive applied in accordance with recommendations of insulation manufacturer.
- C. Bond mineral fiberboard, polyurethane or polyisocyanurate board, and perlite board to surfaces with adhesive as recommended by insulation manufacturer.
- D. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.

### **3.3 PERIMETER INSULATION:**

- A. Vertical insulation:
  - 1. Fill joints of insulation with same material used for bonding.
  - 2. Bond polystyrene board to surfaces with adhesive applied in accordance with recommendations of insulation manufacturer.
  - 3. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.

### **3.4 EXTERIOR FRAMING OR FURRING SPRAY-APPLIED INSULATION**

- A. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer. Provide support mesh at locations where insulation does not abut adjacent surface to ensure insulation remains in place.

### **3.5 RIGID INSULATION ON SURFACE OF EXTERIOR WALLS:**

- A. On the interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to the face of studs for interior wall finish where shown.

- B. Bond to solid vertical surfaces with adhesive as recommended by insulation manufacturer. Fill joints with adhesive cement.
- C. Use impaling pins for attachment to underside of horizontal surfaces. Space fastenings as required to hold insulation in place and prevent sagging.

### **3.6 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.

### **3.7 INSTALLATION OF CURTAIN-WALL INSULATION:**

- A. Install board insulation in and over curtain-wall construction according to curtain-wall manufacturer's written instructions.
  - 1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass. Install a continuous layer of insulation over the insulation between the curtain-wall framing members and over the curtain-wall framing members themselves (for continuous insulation requirements)
  - 2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

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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. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS.
- B. Wood blocking, and edge strips: Section 06 10 00, ROUGH CARPENTRY.
- C. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.
- D. Roof membrane: Section 07 54 19, POLYVINYL-CHLORIDE (PVC) ROOFING.
- E. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.
- F. Roof expansion joints: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.

**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):
  - C1177/C1177M-08 .....Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
  - C1289-10 .....Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
  - D41-05 .....Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
  - D312-06 .....Asphalt Used in Roofing
  - 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

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 33, with minimum R-value at any location of 10.
- B. FM Approvals: Provide roof insulation complying with requirements in FM Approvals 4450 and 4470 as part of specified roofing system, listed in FM Approvals "RoofNav" as part of roofing system meeting Fire/Windstorm Classification in Division 07 roofing section.

## 1.5 QUALITY CONTROL

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

## 1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:

1. 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. Green Globes and Federal Sustainable Design Submittals:

1. For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
2. 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. 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 and terminations.
2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.

E. Samples:

1. Roof insulation, each type.
2. 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 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of

Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.8 DELIVERY, STORAGE AND MARKING**

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

## **1.8 QUALITY ASSURANCE:**

- A. Roof insulation on steel or concrete 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.

## **1.9 WARRANTY:**

- A. Roof insulation work subject to the terms of the Article "Warranty of Construction" of Section 00 72 00, GENERAL CONDITIONS, except extend the warranty period to a full-value warranty period of 15 years to include roof and deck insulation components and PVC roofing membrane.

## **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. 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.
- F. 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 factory-tapered insulation.
  2. Cut to provide high and low points with crickets and slopes as shown, and if not shown, as required to properly eliminate standing water.
  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. Substrate Board:
  - 1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 13 mm (1/2 inch) thick, factory primed.
- C. Cover Board:
  - 1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 6 mm (1/4 inch) thick, factory primed. Compatible with roof membrane and approved by roof membrane manufacturer.

## **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.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

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

### **3.3 SUBSTRATE BOARD INSTALLATION**

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

### **3.4 RIGID INSULATION INSTALLATION**

- A. Insulation Installation, General:
  - 1. Install roof insulation in accordance with roofing system manufacturer's written instructions.
  - 2. Install roof insulation in accordance with requirements of FM Approval's Listing for specified roofing system.
  - 3. Mechanically fasten first layer of roof insulation to secure to metal deck (through substrate board) and to concrete deck (future floor slab) using mechanical fasteners specifically designed for fastening specified board-type roof insulation to deck type. Fasten insulation to resist up-lift pressure at corners, perimeters, and field of roof.

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: Install over substrate board.
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 4-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 membrane.

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. Unless required otherwise by FM or other applicable agency, provide Mechanically Fastened and Adhered Insulation:
  - a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
    - 1) Mechanically Fastened Insulation:
      - a) Fasten insulation in accordance with FM Approval's "RoofNav" requirement in Division 07 roofing section.
      - b) Fasten insulation to resist uplift pressures specified in Division 07 roofing section.
  - b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.

- 1) Adhered Insulation:
  - a) Prime substrate as required.
  - b) Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.
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). Unless required otherwise by FM or other applicable agency, fasten cover boards according to "Adhered Insulation" requirements.
  - a. Adhered Insulation
    - 1) Prime Substrate as required.
    - 2) Set cover board firmly in uniform application of full-spread insulation adhesive.

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## **SECTION 07 40 00 SIDING PANELS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This section specifies insulated metal wall panel system consisting of foamed-insulation core panels and accessories as shown.

#### **1.2 RELATED WORK**

- A. Metal Studs: Section 05 40 00, COLD-FORMED METAL FRAMING.
- B. Flashing and Trim: Section 07 60 00, FLASHING AND SHEET METAL.
- C. Metal Wall Panels: Section 07 41 50, COMPOSITE METAL BUILDING PANELS.
- D. Sealant: Section 07 92 00, JOINT SEALANTS.
- E. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

#### **1.3 MANUFACTURER'S QUALIFICATIONS**

Insulated composite metal wall systems shall be products of a manufacturer regularly engaged in the fabrication and erection of composite metal wall systems of the type and design shown and specified.

#### **1.4 FIRE RATING**

- A. At rated wall construction locations, composite metal wall systems shall have a fire rating as indicated on the Drawings, when tested in accordance with ASTM E119.
- B. Approved as a Class I wall panel per ANSI/FM 4880.
- C. Surface Burning Characteristics: Not greater than the following per ASTM E84 – Flame Spread Index (25 or less), Smoke Developed Index (450 or less).

#### **1.5 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples: Metal panel, 150 mm (six inch) square, showing finish, each color and texture.
- C. Shop Drawings: Wall panels, showing details of construction and installation. Collateral steel framing, U value, thickness and kind of material, closures, flashing, fastenings and related components and accessories.
- D. Manufacturer's Literature and Data: Wall panels
- E. Fire Test Report: Report of fire test by recognized testing laboratory for fire rating specified, showing details of construction.

#### **1.6 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

### **1.7 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
- ASTM A 792..... Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
- ASTM C 920..... Specification for Elastomeric Joint Sealants
- ASTM C 1363..... Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
- ASTM D 1929..... Standard Test Method for Determining Ignition Temperature of Plastics
- ASTM E 84..... Test Methods for Surface Burning Characteristics of Building Materials.
- E119-10..... Fire Test of Building Construction and Materials
- ASTM E 283..... Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen
- ASTM E 331..... Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

### **1.8 PREINSTALLATION CONFERENCE**

To be conducted at the Project Site.

### **1.9 DELIVERY, STORAGE, AND HANDLING**

Protect insulated composite backup panel system during shipping, handling, and storage to prevent staining, denting, or other visible damage. Deliver, unload, store, and erect metal backup panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations. Protect from exposure to sunlight.

### **1.10 WARRANTY**

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period - **Warranty Period**: Five (5) years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. As back-up wall to metal wall panel finish:
  - 1. Metallic-Coated Steel Sheet, Coil Coated, per ASTM A 755/A 755M.
    - a. Aluminum-Zinc Alloy Coated Steel: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 37 (Class AZM150 coating designation, Grade 275); structural quality, with new embossed flat surface.
    - b. 2. Metal Faces: [0.011-inch (0.286-mm)/29 ga.] [0.019 inch/26 gage (0.48 mm)] thick. (26 ga galvanized steel required only for fire rating requirements and for MetalWrap vertical panel installations)
    - c. Coil Coating:
      - 1) Outer Face: 0.2-mil (0.0058-mm) thick clear coating. (Primer coat on any 26ga galvanized steel)
      - 2) b. Inner Face: 0.2-mil Primer coating.
  - 2. Polyisocyanurate Core: Foamed-in-place modified polyisocyanurate, closed-cell, utilizing no CFC or HCFC compounds, with density minimum 2.4 lb/cu. ft. (39 kg/cu. m) and compressive strength minimum 15 lb/sq. in (103 kPa).
  - 3. Panel Sealant/Vapor Seal: Factory-applied non-curing butyl.
- B. As back-up wall to masonry veneer finish:
  - 1. Metallic-Coated Steel Sheet, Coil Coated, per ASTM A 755/A 755M.
    - a. Aluminum-Zinc Alloy Coated Steel: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 37 (Class AZM150 coating designation, Grade 275); structural quality, with nonembossed, flat surface.

- b. Metal Faces: [0.011-inch (0.286-mm)/29 ga.] [0.019 inch/26 gage (0.48 mm)] thick. (26 ga galvanized steel required only for fire rating requirements and for MetalWrap vertical panel installations)
- c. Coil Coating:
  - 1) Outer Face: 0.2-mil Primer Coating
  - 2) Inner Face: 0.2-mil (0.0058-mm) thick clear coating. (Primer coat on any 26ga galvanized steel)
- 2. Polyisocyanurate Core: Foamed-in-place modified polyisocyanurate, closed-cell, utilizing no CFC or HCFC compounds, with density minimum 2.4 lb/cu. ft. (39 kg/cu. m) and compressive strength minimum 15 lb/sq. in (103 kPa).
- 3. Panel Sealant/Vapor Seal: Factory-applied non-curing butyl.

## 2.2 INSULATED COMPOSITE BACKUP PANELS

- A. Factory-foamed, insulated composite backup panels with interlocking side joinery and butt end joints. Fabricate with metal facings bonded to foamed-in-place core. Fabricate interior metal face with planking ribs. Form interlocking joinery to accept concealed fasteners for attachment to supports.
  - 1. **Panel Thickness** and Thermal Resistance of Finished Wall: 2-inches (51-mm) panel; R-14 wall.

## 2.3 ACCESSORIES

- A. Panel Mounting Clips (for Metal Wall Panel Finish): Manufacturer furnished panel mounting clips, 0.064-inch/14 ga (1.63-mm) thick G90 galvanized steel, configured to serve as attachment points for vertical subgirts for the attachment of horizontal cladding.
- B. Galvanized Panel Mounting Clips and Integrated Masonry Anchors (for Masonry Veneer Finish): Manufacturer furnished as designated below shall be incorporated in the panel joinery and panel midpoint. Clip shall serve as panel mounting clips and attachment points for masonry ties.
  - 1. Hohmann and Barnard 200 Series Joint Anchors
  - 2. Hohmann and Barnard 200 Series Type 1 Surface Mount Anchors
- C. Self-Adhering Sheet Flashing: Minimum 25-mil (0.64-mm) modified bituminous sheet, recommended by panel manufacturer for application.
- D. Sealant:
  - 1. Concealed: Non-skinning butyl sealant, ASTM C 920.
  - 2. Exposed: Elastomeric silicone sealant, ASTM C 920, as recommended by panel manufacturer.

- E. Fasteners: Corrosion-resistant, self-tapping and self-drilling screws, bolts, nuts, and other fasteners as recommended by panel manufacturer for application.

- 1. Size fasteners to prevent penetration of interior panel facing.

## **2.4 FABRICATION**

- A. General: Fabricate insulated composite backup panels at the factory, using manufacturer's standard procedures and processes identical to tested units and as necessary to meet performance requirements.
  - 1. Fabricate insulated composite backup panels with joints between panels designed to form weathertight seals.
  - 2. Factory formed insulated composite backup panels in a continuous process with no glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.
  - 3. Accessories and fastenings shall be the same material and finish as the panels. Thickness and installation of accessories and flashing shall be as recommended by panel manufacturer.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION**

- A. Examine building structure with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation.
  - 1. Inspect framing that will support insulated composite backup panel system to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to panel manufacturer.
    - a. Maximum deviations acceptable to insulated composite backup panel system manufacturer:
      - 1) 3/8-inch (9.5-mm) in any 20-foot (6.1-m) length vertically or horizontally from the framing face plane.
      - 2) 3/4-inch (19-mm) maximum deviation from the framing face plane on any building elevation.
- B. Correct out of tolerance work and other deficient conditions prior to proceeding with insulated composite backup panel installation.

### **3.2 INSULATED COMPOSITE BACKUP PANEL SYSTEM INSTALLATION**

- A. General: Install insulated composite backup panel system in accordance with approved shop drawings and manufacturer's written recommendations.
- B. Installation: Attach backup panels to supports at each panel connection point indicated on approved shop drawings.



1. Install with drain plane of panel facing weather side of installation.
2. Fasten insulated backup panels to building framing with clips provided by manufacturer and recommended fasteners.
3. Horizontal Installation:
  - a. Working from base to top of the backup panel installation, lap upper panel over lower panel to form a weather tight joint oriented to allow gravity drainage.
  - b. Install vertical butt joints tight with no gap, set against continuous supports.
  - c. Set panel ends in continuous bead of non-curing butyl sealant as indicated in manufacturer's installation details.
  - d. Seal butt joints between adjacent panels with a continuous strip of self-adhering flashing at bottom row of panels and where additionally recommended by manufacturer.
- C. Flashing: All flashing and related closures and accessories in connection with the preformed metal panels shall be provided as indicated and as necessary to provide a watertight installation. Details of installation, which are not indicated, shall be in accordance with the panel manufacturer's printed instruction and details, or the approved shop drawings. Installation shall allow for expansion and contraction of flashing.

### **3.3 ERECTION TOLERANCES**

Installation Tolerances: Align insulated composite backup panel system within installed tolerance of 1/4-inch in 20 feet (6-mm in 6.1-m), noncumulative, on level and plumb and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

### **3.4 ISOLATION OF ALUMINUM**

- A. Isolate aluminum in contact with or fastened to dissimilar metals other than stainless steel, white bronze, or other metal compatible with aluminum by one of the following:
  1. Painting the dissimilar metal with a prime coat of Zinc-Molybdate followed by two coats of aluminum paint.
  2. Placing a non-abrasive tape or gasket between the aluminum and the dissimilar metal.
- B. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of alkali-resistant bituminous paint.
- C. Paint aluminum in contact with wood or other absorptive materials, that may become repeatedly wet, with two coats of bituminous paint, or two coats of aluminum paint. Seal joints with caulking material.

### **3.5 PROTECTION AND CLEANING**

Protect panels and other components from damage during and after erection, and until project is accepted by the Government.

--- E N D ---

**SECTION 074150**  
**COMPOSITE METAL BUILDING PANELS**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. Scope: Provide design and engineering, labor, material, equipment, related services and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for metal-faced composite wall panels as required for the complete performance of the work, and as shown on the Drawings and as herein specified.
- B. Section Includes
  - 1. The extent of panel system work is indicated on the drawings and in these specifications.
  - 2. Panel system requirements include the following components:
    - a. Aluminum-faced composite panels with mounting system. Panel mounting system including anchorages, furring, fasteners, gaskets and sealants, related flashing adapters and masking for a complete installation.
    - b. Panel manufacturer recommends that system should include shop-installed aluminum stiffeners on all panels of 20 square feet or larger. Minimum stiffener recommendation is one per 20 square feet of panel area.
    - c. Parapet coping, column covers, soffits, sills, border and filler items may be indicated as integral components of the panels system or as designed.
    - d. All flashing metal required shall be provided by the panel manufacturer.
    - e. System to be fabricated and installed per local code requirements.
- C. Related Documents
  - 1. Drawings and general provisions of the contract, including general and supplementary conditions and technical specifications, apply to this section.
  - 2. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.2 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Design metal-faced composite wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- 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 30 lbf/sq. ft., acting inward or outward.
  - 2. Deflection Limits: Metal-faced composite wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span at the perimeter and 1/60 of the span anywhere in the panel of the span.
- C. Air Infiltration: When tested in accordance with ASTM E 283, air infiltration at 6.24 psf shall not exceed 0.060 cfm per square foot of wall area.
- D. Water Infiltration: Water infiltration is defined as uncontrolled water leakage through the exterior face of the assembly. Systems shall be designed to drain any water leakage occurring at the joints. No water infiltration shall occur in any system under a differential static pressure of 15.00 psf after 15 minutes of exposure in accordance with ASTM E 331.
- E. Water Penetration at Dynamic Pressure: AAMA 501.1 at the same test pressure difference specified for the static pressure test.
- F. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures in engineering, fabricating, and installing exterior metal fabrications to prevent buckling, opening of joints, overstressing of components and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
  - 1. Temperature Change (Range): 120 F or 67 °C ambient, 180 F or 100 C material surfaces.
- G. Pressure Equalization of Horizontal Joinery: Shall pass the criteria for a pressure equalized horizontal joint in accordance with AAMA 508.
- H. Seismic Performance: Comply with AAMA 501.4.

### **1.3 QUALITY ASSURANCE**

- A. Composite panel manufacturer shall have a minimum of 15 years' architectural experience in the manufacture of this product and be located within the continental United States.

- B. It is recommended that fabrication and installation of composite panels shall be from a single source. If not single source, both panel fabricator and the installer must show proof of past successful collaboration.
- C. Fabricator shall be acceptable to composite panel manufacturer.
- D. Fabricator and Installer shall have a minimum 5 years' experience in architectural metal panel work similar in scope and size to this project.
- E. Coordinate fabrication schedule with construction progress as directed by the contractor to avoid delay of work.
- F. Shop drawings shall show the preferred joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration, on the inside face of the panel system as determined by ASTM E331.
- G. Maximum deviation from vertical and horizontal alignment of erected panels: 6 mm (1/4") in 6 m (20') non-accumulative.
- H. Panel fabricator and installer shall assume undivided responsibility for all components of the exterior panel system. including but not limited to, attachment to sub-construction, panel-to-panel joinery, panel-to-dissimilar-material joinery and joint seal associated with the panel system.
- I. Engineer Qualifications: The engineer shall be a professional engineer legally authorized to practice in the jurisdiction where the Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of products similar to this Project in material, design, and extent, and that have a record of successful in-service performance.
- J. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.
- K. Preinstallation Conference: Conduct conference at Project site.
- L. Single Source Responsibility: Obtain each type of metal-faced composite wall panel from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work.
- M. Coordination: Coordinate composite panel systems with rain drainage work, flashing, trim, and construction of walls and other adjoining work to provide a leakproof, secure, and non-corrosive installation.

## **1.4 REFERENCES**

- A. American Society for Testing and Materials
  - 1. E330: Structural Performance of Exterior Windows, Curtain Walls and Doors Under the Influence of Wind Loads.
  - 2. E283: Rate of Leakage Through Exterior Windows, Curtain Walls and Doors.
  - 3. D1781: Climbing Drum Peel Test for Adhesive Materials.
- B. Underwriter's Laboratories:
  - UL 1715: Room Fire Test Standard for Interior of Foam Plastic Systems.
- C. American Architectural Manufacturers Association
  - AAMA-620

## **1.5 SUBMITTALS**

- A. Submittals shall be in conformance with Section 01 33 23.
- B. Samples
  - 1. Panel Assembly: Two samples of each type of assembly, 304 mm (12") x 304 mm (12") minimum.
  - 2. Two samples of each color or finish selected, 76 mm (3") x 102 mm (4") minimum.
- C. Shop Drawings: Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.
- D. Manufacturer's literature shall certify that material meets specifications.
- E. Fabrication Tickets: Submit fabrication drawings showing location and type of aluminum-extruded stiffeners at typical panels and at corner panels, if required.
- F. Documents showing product compliance with the local building code shall be submitted prior to the bid. These documents may include evaluation reports, test reports, supporting document and drawings, and manufacturer's data. The architect must approve alternate material prior to bid date.
- G. Delegated-Design Submittal: For metal-faced composite wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
- H. Maintenance data.

## **1.6 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.7 WARRANTY**

- A. The fabricator and installer will warrant the wall system for a period of 2 years from the Date of Substantial Completion, that the fabrication and installation workmanship will be free from defects.
- B. The aluminum composite material manufacturer shall warrant for a period of 30 years from the Date of Substantial Completion, against Max 5 fade based on ASTM D2244 and Max 8 chalk based on ASTM D4212 and delamination of the paint finish.

## **1.8 PACKAGING, SHIPPING, STORAGE, AND HANDLING**

- A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.
  - 1. 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. Store materials in accordance with panel Manufacturer's written instructions in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage.
  - 2. 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 °F (67 °C).

3. Retain strippable protective covering on metal-faced composite wall panel for period of panel installation.

## **1.9 PROJECT CONDITIONS**

- A. Environmental Requirements: 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: Take field measurements prior to fabrication of the work and preparation of shop drawings, to ensure proper fitting of the work. Show recorded measurements on final shop drawings. Notify the Owner and the Architect, in writing, of any dimensions found which are not within specified dimensions and tolerances in the Contract Documents, prior to proceeding with the fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the work.
  1. Field fabrication is allowed to ensure proper fit but keep field fabrication to minimum with majority of fabrication being done under controlled shop conditions. Where final panel dimensions cannot be established by field measurement before commencement of panel manufacturing, make allowance for field adjustments and thermal movement as recommended by panel manufacturer.

## **PART 2 – PRODUCTS**

### **2.1 PANEL MATERIALS**

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
  1. Surface: Smooth, flat finish.
  2. Exposed Coil-Coated Finishes:
    - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
    - b. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES, for color information.
  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.
- B. Panel Sealants: ASTM C 920.



## **2.2 MISCELLANEOUS METAL FRAMING**

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 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 nominal thickness.
- C. Zee Clips: 0.079-inch nominal thickness.
- D. Base or Sill Angles and Channels: 0.079-inch nominal thickness.
- E. Hat-Shaped, Rigid Furring Channels:
  - 1. Nominal Thickness: As required to meet performance requirements.
  - 2. Depth: As indicated.
- F. Cold-Rolled Furring Channels: Minimum 1/2-inch-wide flange.
  - 1. Nominal Thickness: As required to meet performance requirements.
  - 2. Depth: As indicated.
  - 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
  - 4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

## **2.3 MISCELLANEOUS MATERIALS**

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6 or Alloy 6061-T6..
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Exposed fasteners shall be stainless steel or as recommended by Panel Manufacturer, with heads matching color of metal-faced composite wall panels by means of factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers. Concealed fasteners shall be stainless steel, or as recommended by Panel Manufacturer.

## **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.
  - 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 (Note that available color selections will play a large role in the selection of Manufacturer and Product):
  - a. Alcan Composites USA Inc.; Alucobond.
  - b. Approved Product from an Approve Manufacturer
- B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch-thick, coil-coated or aluminum sheet facings.
  - 1. Panel Thickness: 0.157 inch (4 mm).
  - 2. Core: Standard.
  - 3. Exterior Finish: 2-coat fluoropolymer, Mica fluoropolymer, Metallic fluoropolymer.
    - a. Color: As selected from manufacturer's full range and finish options.
- C. Attachment System Components: Formed from extruded aluminum.
  - 1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips, and anchor channels.

## **2.5 ACCESSORIES**

- A. Wall Panel Accessories: Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, stiffeners, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.
- B. Flashing and Trim: Formed from 0.040-inch-minimum thickness, aluminum sheet provided by Panel Manufacturer, 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. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bead of non-hardening sealant.
- C. Extrusions, formed members, sheet and plate shall conform with ASTM B209 and the recommendations of the manufacturer.

- D. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.
- E. Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.
- F. Fasteners (concealed/non-corrosive): Fasteners as recommended by system fabricator and installer.

## **2.6 FABRICATION**

- A. General: Fabricate and finish metal-faced composite wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal-faced composite wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Metal-Faced Composite Wall Panels: Factory form panels in a continuous process with no 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 maximum.
  - 5. Flatness: Panels shall be visually flat.
  - 6. Panel Surfaces: Shall be free of scratches or marks caused during fabrication.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
- E. System Characteristics

1. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
2. Fabricate panel system to dimension, size and profile based on a design temperature of 68°F (20°C).
3. Fabricate panel system to avoid compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature changes and at all times remain air- and watertight.
4. The exposed finish side of the panel shall have a removable protective film applied prior to fabrication, which shall remain on the panel during fabrication, shipping and erection to protect the surface from damage.

F. System Type

Rout-and-Return Wet System: Fabricator and installer must provide an engineered system including clips, fasteners, anchors, spacers, trim, flashings, gaskets, sealant, etc.

## **PART 3 – EXECUTION**

### **3.1 INSPECTION**

- A. Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.
1. Examine substrates, areas, and conditions, with the Installer present, for compliance with requirements for installation tolerances, metal-faced composite wall panel supports, and other conditions affecting performance of the work.
  2. 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.
  3. Examine backing substrate to verify that joints are supported by framing or blocking and that installation is within flatness tolerances required by metal-faced composite wall panel manufacturer.
  4. Verify that backing substrate will prevent air infiltration or water penetration.
  5. 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.
  6. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

- B. Surfaces to receive panels shall be structurally sound as determined by a registered engineer. In no case shall metal structural supports be less than 18 gauge.

### **3.2 PREPARATION**

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

### **3.2 INSTALLATION**

- A. 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.
- B. 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.
- C. Erect panels plumb and level.
- D. Attachment system shall allow for the free vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F (-29°C) to +180°F (+82°C). Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement are not to be permitted. Fabrication, assembly and erection procedure shall account for the ambient temperature at the time of the respective operation.
- E. Panels shall be erected in accordance with an approved set of shop drawings.
- F. Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.

- G. Conform to panel fabricator's instructions for installation of concealed fasteners.
- H. Do not install component parts that are observed to be defective, including warped, bowed, dented, scraped and broken members.
- I. Do not cut, trim, weld or scrape component parts during erection in a manner that would damage the finish, decrease strength or result in a visual imperfection or a failure in performance. Return component parts that require alteration to shop for refabrication, or for replacement with new parts.
- J. Separate dissimilar metals; use appropriate gaskets and fasteners to minimize corrosive or electrolytic action between metals.

### **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.

### **3.5 ERECTION TOLERANCES**

- A. Maximum variation from plane or location shown on shop drawings shall be 1/2 inch in 30 feet (non-accumulative) of length and up to 3/4 inch 300 feet (non-accumulative).
- B. Maximum deviation for vertical member shall be 0.10 inch in 25 feet run.
- C. Maximum deviation for a horizontal member shall be 0.10 inch in 25 feet run.
- D. Maximum offset from true alignment between two adjacent members abutting end to end, in line shall be 0.03 inch.

### **3.6 ADJUSTING AND CLEANING**

- A. Remove and replace panels damaged beyond repair as a direct result of panel installation. After installation, panel repair and replacement shall become the responsibility of the general contractor.
- B. Repair panels with minor damage.
- C. Remove masking film as soon as possible after installation. Masking intentionally left in place after panel installation on an elevation shall become the responsibility of the general contractor.
- D. Any additional protection, after installation, shall be the responsibility of the general contractor to remove.
- E. Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants.
- F. Final cleaning shall not be part of the work of this section.

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**SECTION 07 54 19**  
**POLYVINYL-CHLORIDE (PVC) ROOFING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Polyvinyl Chloride (PVC) sheet roofing fully adhered to roof deck.

**1.2 RELATED WORK**

- A. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS.
- B. Treated wood framing, blocking, and nailers: Section 06 10 00, ROUGH CARPENTRY
- C. Roof Insulation: Section 07 22 00, ROOF AND DECK INSULATION.
- D. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.
- E. Color: 09 06 00, SCHEDULE FOR FINISHES

**1.3 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):  
ANSI/SPRI ES-1-03 ..... Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):  
ASCE/SEI-7-10 ..... Minimum Design Loads for Buildings and Other Structures
- D. ASTM International (ASTM):  
C67-09 ..... Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile  
C140-09 ..... Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units  
C1371-04 ..... Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers  
C1549-04 ..... Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer  
D2240-05 ..... Rubber Property - Durometer Hardness



- D4263-83(2005).....Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
- D4434-06 .....Poly (Vinyl Chloride) Sheet Roofing
- E96-00.....Water Vapor Transmission of Materials
- E108-10.....Standard Test Methods for Fire Tests of Roof Coverings
- E408-71(R2008) .....Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
- E1918-06.....Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
- E1980-01.....Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
- G21-09 .....Resistance of Synthetic Polymeric Materials to Fungi
- E. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) ASHRAE 90.1-2007 .....Energy Standard for Buildings Except Low-Rise Residential Buildings, Appendix f.
- F. Cool Roof Rating Council:
- CRRC-1 .....Product Rating Program, [www.coolroofs.org](http://www.coolroofs.org)
- G. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
- 4450-89 .....Approved Standard for Class 1 Insulated Steel Deck Roofs
- 4470-10 .....Approved Standard for Class 1 Roof Coverings
- 1-28-09.....Loss Prevention Data Sheet: Design Wind Loads.
- 1-29-09.....Loss Prevention Data Sheet: Above-Deck Roof Components
- 1-49-09.....Loss Prevention Data Sheet: Perimeter Flashing
- H. National Roofing Contractors Association: Roofing and Waterproofing Manual
- I. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog, [www.biopreferred.gov](http://www.biopreferred.gov)
- J. U.S. Department of Energy (DoE): Roof Products Qualified Product List, [www.energystar.gov](http://www.energystar.gov)

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- B. Roofing System Energy Performance Requirements: Provide a roofing system identical to components that have been successfully tested by a qualified independent testing and inspecting agency to meet the following requirements:

1. Energy Performance, Energy Star: Provide roofing system that is listed on DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
2. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E1980 based on testing identical products by a qualified testing agency.
3. Energy Performance, CRRC-1: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.
4. Energy Performance, Aged: Provide roofing system with minimum three-year aged solar reflectance not less than 0.55 when tested in accordance with ASTM C1549 or ASTM E1918, and in addition, a minimum three-year-aged thermal emittance of 0.75 when tested in accordance with ASTM C1371 or ASTM E408.
  - a. Where tested aged values are not available for proposed product, submit calculations to adjust initial solar reflectance to demonstrate compliance as indicated in ASHRAE 90.1-2007 Addendum f.
  - b. Alternatively, provide roofing system with minimum three-year aged Solar Reflectance Index of not less than 64 when determined in accordance with the Solar Reflectance Index method in ASTM E1980 using a convection coefficient of 2.1 BTU/h-ft<sup>2</sup> (12 W/m<sup>2</sup>K).

## **1.5 QUALITY CONTROL**

### **A. Installer Qualifications:**

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

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

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

C. Product/Material Requirements:

1. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.
2. Bio-Based Materials: 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).

D. Roofing system design standard requirements:

1. Recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to modified bituminous sheet roofing for storage, handling and application.
2. Recommendations of FM Approvals 1-49 Loss Prevention Data Sheet for Perimeter Flashings.
3. Recommendations of ANSI/SPRI ES-1 for roof edge design.
4. FM Approvals Listing: Provide roofing membrane, base flashing, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a roofing system and that are listed in FM Approvals "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
  - a. Fire/Windstorm Classification: Class 1A-90.
  - b. Hail Resistance: MH.

E. Pre-Roofing Meeting:

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

## **1.6 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, SAMPLES.
- B. Product Data:
  - 1. Adhesive materials.
  - 2. Membrane sheet roofing and flashing membrane.
  - 3. Roofing cement.
  - 4. Roof walkway.
  - 5. Fastening requirements.
  - 6. Application instructions.
- C. Samples:
  - 1. Nails and fasteners, each type.
- D. Shop Drawings: Include plans, sections, details, and attachments.
  - 1. Base flashings and terminations.
- E. Certificates:
  - 1. Indicating materials and method of application of roofing system meets requirements of FM Approvals "RoofNav" for specified fire/windstorm classification.
  - 2. Indicating compliance with energy performance requirement.
- F. Warranty: As specified.
- G. Documentation of supervisors' and inspectors' qualifications.
- H. Field reports of roofing inspector.
- I. Contract Close-out Submittals:
  - 1. Maintenance Manuals.
  - 2. Warranty signed by installer and manufacturer.

## **1.7 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.8 DELIVERY, STORAGE AND HANDLING**

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

## **1.9 ENVIRONMENTAL REQUIREMENTS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Environmental Controls: Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- C. Protection of interior spaces: Refer to Section 01 00 00, GENERAL REQUIREMENTS.

## **1.10 WARRANTY**

Roofing work subject to the terms of the Article "Warranty of Construction," of Section 00 72 00, GENERAL CONDITIONS, except extend the warranty period to a full-value warranty period of 15 years, to include roof and deck insulation components and PVC Roofing Membrane.

## **PART 2 - PRODUCTS**

### **2.1 PVC SHEET ROOFING**

- A. PVC Sheet: ASTM D4434, Type IV, fabric reinforced, 1.0 mm (40 mils) nominally thick (minimum), with no backing.
  1. Color: White.
- B. Additional Properties:
  1. Water Vapor Permeance, ASTM E96 Proc B, Method A: 0.25 perms.
  2. Fungi Resistance, ASTM G21: After 21 days, no sustained growth or discoloration.
  3. Fire Resistance, ASTM E108: Class A; no combustion beyond flame/heat source.
  4. Thickness – Nominal, ASTM D751: 40-mils – Type IV.
  5. Breaking Strength, ASTM D751 – Grab Method: 435 x 368 lbf.
  6. Elongation at Break, ASTM D751 – Grab Method: 30 Percent
  7. Heat Aging, ASTM 3045, 56 Days at 176 Degrees (F): 90 Percent of Control – no cracking, chipping, or crazing.
  8. Factory Seam Strength, ASTM D751 – Grab Method: 468 lbf.
  9. Tearing Strength, ASTM D751 Procedure B: 91 x 128 lbf.
  10. Low Temperature Bend, ASTM D2136: -40 Degrees (F).

11. Accelerated Weathering, ASTM G154: No cracking, checking, crazing, or erosion at 5,000 hours of exposure.
12. Linear Dimensional Change, ASTM D1204 – 6 Hours at 176 Degrees (F): -0.2 Percent.
13. Water Absorption, ASTM D570 – 166 Hours at 158 Degrees (F): 1.40 Percent.
14. Static Puncture, ASTM D5602: 56 lbs.
15. Dynamic Puncture, ASTM D5635: 474 pdl-ft.
16. Solar Reflectance, ASTM C1549: 88 Percent.
17. Thermal Emittance, ASTM C1371-98: 87 Percent.
18. Thermal Emissivity, ASTM E408: 95 Percent.
19. EMMAQUA Exposure, ASTM690, Desert Sun: >8.1 million langley.
20. Weight, ASTM D751: 0.22 lbs per sq. ft.
21. Underwriters Laboratories, UL-790: Classes A, B and C approved.

## **2.2 ACCESSORIES:**

- A. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.
- B. Bonding Adhesive: Manufacturer's standard, water based.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 25 by 3 mm (1 by 1/8 inch) thick; with anchors.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening membrane to substrate.
- E. Miscellaneous Accessories: Provide sealers, preformed flashings, reinforced preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories acceptable to manufacturer.

## **2.3 ADHESIVE AND SEALANT MATERIALS:**

- A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
  1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
  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. Gypsum Board and Panel Adhesives: 50 g/L.

- c. Multipurpose Construction Adhesives: 70 g/L.
- d. Fiberglass Adhesives: 80 g/L.
- e. Single-Ply Roof Membrane Adhesives: 250 g/L.
- f. Other Adhesives: 250 g/L.
- g. PVC Welding Compounds: 510 g/L.
- h. Adhesive Primer for Plastic: 650 g/L
- i. Single-Ply Roof Membrane Sealants: 450 g/L.
- j. Nonmembrane Roof Sealants: 300 g/L.
- k. Sealant Primers for Nonporous Substrates: 250 g/L.
- l. Sealant Primers for Porous Substrates: 775 g/L.

## **2.4 WALKWAYS**

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway, 5'-0" x 5'-0" by approximately 18 inch (3 mm) thick and acceptable to roofing systems manufacturer.
  - 1. Walkways must be installed with edges touching to provide a continuous walkway surface.
  - 2. Walkways are to be heat welded on all four (4) sides.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION:**

- A. Examine substrates and conditions with roofing Installer and roofing inspector to verify compliance with project requirements and suitability to accept subsequent roofing work. Correct unsatisfactory conditions before proceeding with roofing work.
- B. Do not apply roofing if roof surface will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless system is protected.

### **3.2 PREPARATION**

- A. Complete roof deck construction prior to commencing roofing work:
  - 1. Install curbs, blocking, edge strips, nailers, cants, and other components where insulation, roofing, and base flashing is attached to, in place ready to receive insulation and roofing.
  - 2. Complete deck and insulation to provide designed drainage to working roof drains.
  - 3. Document installation of related materials to be concealed prior to installing roofing work.
- B. Dry out surfaces, including the flutes of metal deck that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates.
- C. Sweep decks to broom clean condition. Remove all dust, dirt or debris.
- D. Remove projections that might damage materials.
- E. Existing Membrane Roofs and Repair Areas:

1. At areas to be altered or repaired, remove loose, damaged, or cut sheet that is not firmly adhered only where new penetrations occur or repairs are required.

### **3.3 TEMPORARY PROTECTION**

- A. Install temporary protection at the end of day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent. Comply with approved temporary protection plan.
- B. Install temporary cap flashing over the top of base flashings where permanent flashings are not in place to provide protection against moisture entering the roof system through or behind the base flashing. Securely anchor in place to prevent blow off and damage by construction activities.
- C. Provide for removal of water or drainage of water away from the work.
- D. Provide temporary protection over installed roofing by means of duckboard walkways, plywood platforms, or other materials, as approved by Resident Engineer, for roof areas that are to remain intact, and that are subject to foot traffic and damage. Provide notches in sleepers to permit free drainage.

### **3.4 INSTALLATION, GENERAL**

- A. FM Approvals Installation Standard: Install roofing membrane, base flashings, wood cants, blocking, curbs, and nailers, and component materials in compliance with requirements in FM 4450 and FM 4470 as part of a membrane roofing system as listed in FM Approval's "RoofNav" for fire/windstorm classification indicated. Comply with recommendations in FM Approvals' Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.
- B. NRCA Installation Standard: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations.
- C. Manufacturer Recommendations: Comply with roofing system manufacturer's written installation recommendations.
- D. Coordination with related work: Coordinate roof operations with roof insulation and sheet metal work so that insulation and flashings are installed concurrently to permit continuous roofing operations.
- E. Installation Conditions:
  1. Apply dry roofing materials. Apply roofing work over dry substrates and materials.
  2. Apply materials within temperature range and surface and ambient conditions recommended by manufacturer.
  3. Except for temporary protection, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, ice, fog or frost) is present in any amount in or on the materials to be covered or installed:



### 3.5 INSTALLATION OF PVC ROOFING

- A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with PVC.
- B. Install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.
- C. Commence installation at the low point of the roof and work towards the high point.
- D. Position the membrane so it is free of buckles and wrinkles.
- E. Roll sheet out on deck; inspect for defects as being rolled out and remove defective areas. Allow for relaxing before proceeding.
  - 1. Lap edges and ends of sheets six inches or more as recommended by the manufacturer.
  - 2. Heat weld laps. Apply pressure as required. Seam strength of laps as required by ASTM D4434.
  - 3. Check seams to ensure continuous adhesion and correct defects.
  - 4. Anchor perimeter to deck or wall as specified.
- F. Repair areas of welded seams where samples have been taken or marginal welds, bond voids, or skips occurs.
- G. Membrane Perimeter Anchorage:
  - 1. Install metal fastening strip at the perimeter of each roof level, curb flashing, expansion joints and similar penetrations as indicated and in accordance with membrane manufacturer's instructions on top of roof membrane to deck or wall.
  - 2. Mechanically Fastened Metal Fastening Strip:
    - a. Set top of mechanical fastener set flush with top surface of the metal fastening strip. Space mechanical fasteners a maximum 150 mm (6 inches) on center starting 25 mm (one inch) from the end of the nailing strip.
    - b. When strips are cut round corners and eliminate sharp corners.
    - c. At roof edge metal, turn the membrane down over the front edge of the blocking or the nailer to below blocking. Secure the membrane to the vertical portion of the nailer; or, if required by the membrane manufacturer with fasteners spaced not over 150 mm (6 inches) on centers.
    - d. At parapet walls, intersecting building walls and curbs, secure the membrane to the structural deck or wall with fasteners.
- H. Adhered System:
  - 1. Apply adhesive in quantities required by roof membrane manufacturer.

2. Fold sheet back on itself after rolling out and coat the bottom side of the membrane and the top of the deck with adhesive. Do not coat the lap joint area.
3. After adhesive has set according to adhesive manufacturers application instruction, roll the membrane into the adhesive in a manner that minimizes voids and wrinkles.
4. Repeat for other half of sheet. Cut voids and wrinkles to lay flat and clean for repair patch over cut area.

### **3.6 INSTALLATION OF FLASHING**

- A. Install flashings as the membrane is being installed. If the flashing can not be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.
- B. Flashing Roof Drains:
  1. Install roof drain flashing as recommended by the membrane manufacturer, generally as follows:
    - a. Adhere the PVC roof membrane to the metal flashing with the membrane manufacturer's recommended adhesive.
  2. Turn down the metal drain flashing and PVC roof membrane into the drain body and install clamping ring and strainer.
- C. Installing PVC Base Flashing and Pipe Flashing:
  1. Install PVC flashing membranes to pipes, wall or curbs to a height not less than eight-inches above roof surfaces and 100 mm (four inches) on roof membrane.
    - a. Adhere flashing to pipe, wall or curb with adhesive.
    - b. Form inside and outside corners of PVC flashing membrane in accordance with NRCA manual. Form pipe flashing in accordance with NRCA manual use pipe boot.
    - c. Lap ends not less than 100 mm (four inches).
    - d. Heat weld flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.
    - e. Install flashing membranes in accordance with NRCA manual.
  2. Anchor top of flashing to walls or curbs with fasteners spaced not over 150 mm (6 inches) on centers. Use fastening strip on ducts. Use pipe clamps on pipes or other round penetrations.
  3. Apply sealant to top edge of flashing.
- D. Installing Building Expansion Joints:
  1. Install flexible tubing 1-1/2 time width of joint over joint. Cover tubing with PVC flashing strip adhered to base flashing and lapping base flashing 100mm (4-inches). Finish edges of laps with sealants as specified..

E. Repairs to membrane and flashings:

1. Remove sections of PVC sheet roofing or flashing that is creased wrinkled or fishmouthed.
2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (four inches) beyond damaged, cut, or removed area. Heat weld to roof membrane or flashing.

**3.7 FLEXIBLE WALKWAYS**

- A. Use reinforced sheet not less than 900 mm (three feet) wide.
- B. Heat weld walkway sheet to roof sheet at edges. Weld area 50 mm (two inches) wide by the entire length of the walkway sheet. Heat weld all four sides.
- C. Install walkways end-to-end for a continuous walkway surface..

**3.8 FIELD QUALITY CONTROL:**

- A. Roofing Inspector: Contractor shall engage a qualified roofing inspector for a minimum of 5 full-time days on site to perform roof tests and inspections and to prepare start up, interim, and final reports.
  1. Examine and probe seams in the membrane and flashing in the presence of Resident Engineer and Membrane Manufacturer's Inspector.
  2. Probe edge of welded seams with a blunt tipped instrument. Use sufficient hand pressure to detect marginal welds, voids, skips, and fishmouths.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
  1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements.
  1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

**3.9 PROTECTING AND CLEANING**

- A. Protect membrane roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of acceptance by Owner.
- C. Clean overspray and spillage from adjacent construction. Clean membrane and restore surface to like-new condition meeting solar reflectance requirements.

--- E N D ---

**SECTION 07 60 00**  
**FLASHING AND SHEET METAL**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

- A. Manufactured roof expansion joints and roof hatches: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES
- B. Membrane base flashings and stripping: Section 07 54 19, POLYVINYL-CHLORIDE (PVC) ROOFING.
- C. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.
- D. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- E. Color of factory coated exterior architectural metal and anodized aluminum items: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Integral flashing components of manufactured roof specialties and accessories or equipment: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES, Division 22, PLUMBING sections and Division 23 HVAC sections.
- G. Paint materials and application: Section 09 91 00, PAINTING.

**1.3 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. Aluminum Association (AA):
  - 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  
 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 QUALITY ASSURANCE**

- A. Standards: The "Architectural Sheet Metal Manual", latest revision, of the Sheet Metal and Air Conditioning Contractors National Association, Inc., shall be an applicable standard for method and quality of work under this section where not otherwise shown on the contract drawings or specified.
- B. Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production to the Architect.
- C. Qualifications of Installers: 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 of this Section.

#### **1.5 PERFORMANCE REQUIREMENTS**

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "**The NRCA Roofing Manual**" and SMACNA's "**Architectural Sheet Metal Manual**" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: **120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.**
- C. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
1. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 lbf/sq. ft.): 2.87-kPa (60-lbf/sq. ft.) perimeter uplift force, 4.31-kPa (90-lbf/sq. ft.) corner uplift force, and 1.44-kPa (30-lbf/sq. ft.) outward force.
- D. Wind Design Standard: Fabricate and install copings and roof-edge flashings tested per ANSI/SPRI ES-1 to resist design pressure requirements of the applicable code for the area in which the project is located..
- E. Recycled Content of Copper-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[40] <Insert number>** percent.
- F. Recycled Content of Steel-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25] <Insert number>** percent.

## **1.6 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: For all specified items, including:
  - 1. Flashings
  - 2. Copings
  - 3. Fascia
  - 4. Expansion joints
- C. Manufacturer's Literature and Data: For all specified items, including:
  - 1. Two-piece counterflashing
  - 2. Thru wall flashing
  - 3. Expansion joint cover, each type
  - 4. Nonreinforced, elastomeric sheeting
  - 5. Fascia
- D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.
- E. Maintenance Data.

## **1.7 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.8 PRODUCT HANDLING**

- A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Resident Engineer and at no additional cost to the Owner.

## **1.9 GUARANTEE**

- A. The following guarantee may be made in conjunction with the guarantee in Section 07 54 19, POLYVINYL-CHLORIDE (PVC) ROOFING.
  - 1. The General Contractor and the Roofing Subcontractor shall jointly and separately provide a written guarantee warranting all roofing and flashing weathertight and free from defects in materials and workmanship for the period of two years from the date of final acceptance. All leaks and defects (blistering, fishmouths, ridging splits, open laps, buckles, wrinkles or slippage) shall be corrected at no cost to the Owner for the guarantee period. Roofing shall be inspected by representatives of the General Contractor, Roofing Subcontractor, Architect and Owner sixty (60) days prior to the expiration of the two (2) year guarantee and shall correct all defects in accordance with the original specifications.

## **PART 2 - PRODUCTS**

### **2.1 FLASHING AND SHEET METAL MATERIALS**

- A. General: Protect finishes on exposed surfaces from damage by applying strippable temporary protective film before shipping.
- B. Stainless Steel: ASTM A167, Type 302B, dead soft temper.
- C. Aluminum Sheet: ASTM B209, alloy 3003-H14 except alloy used for color anodized aluminum shall be as required to produce specified color. Alloy required to produce specified color shall have the same structural properties as alloy 3003-H14.
- D. Galvanized Sheet: ASTM, A653.
- E. Nonreinforced, Elastomeric Sheeting: Elastomeric substances reduced to thermoplastic state and extruded into continuous homogenous sheet (0.056 inch) thick. Sheeting shall have not less than 7 MPa (1,000 psi) tensile strength and not more than seven percent tension-set at 50 percent elongation when tested in accordance with ASTM D412. Sheeting shall show no cracking or flaking when bent through 180 degrees over a 1 mm (1/32 inch) diameter mandrel and then bent at same point over same size mandrel in opposite direction through 360 degrees at temperature of -30°C (-20 °F).

### **2.2 FLASHING ACCESSORIES**

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.



- C. 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).
- D. Bituminous Paint: ASTM D1187, Type I.
- E. Fasteners:
  - 1. Use stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.
  - 2. Fasteners:
    - a. Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand the design loads and recommended by manufacturer of primary sheet metal.
    - 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.
- F. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.
- G. Sealant Tape: Pressure-sensitive, 100-percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, non-toxic, non-staining tape 1/2-inch wide and 1/8-inch thick (minimum).
- H. Insect Screening: ASTM D3656, 18 by 18 regular mesh.
- I. Roof Cement: ASTM D4586, Asbestos free.

## **2.3 SHEET METAL THICKNESS**

- A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:
- B. Concealed Locations (Built into Construction):
  - 1. Stainless steel: 0.25 mm (0.010 inch) thick.
  - 2. Galvanized steel: 0.5 mm (0.021 inch) thick.
- C. Exposed Locations:
  - 1. Stainless steel: 0.4 mm (0.015 inch).
- D. Thickness of aluminum or galvanized steel is specified with each item.

## **2.4 FABRICATION, GENERAL**

- A. Jointing:
  - 1. In general, prefinished metal and stainless steel joints, except expansion and contraction joints, shall be locked and soldered.

2. Jointing of stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
  3. Joints shall conform to following requirements:
    - a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.
    - b. Lap joints subject to stress shall finish not less than 25 mm (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. Edges of nonreinforced elastomeric sheeting shall be jointed by lapping not less than 100 mm (4 inches) in the direction of flow and cementing with asphalt roof cement or sealant as required by the manufacturer's printed instructions.
  6. Soldering:
    - a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) of stainless steel.
    - b. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
    - c. Completely remove acid and flux after soldering is completed.
- B. Expansion and Contraction Joints:
1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
  2. Space joints as shown or as specified.
  3. Space expansion and contraction joints for prefinished metal and stainless steel at intervals not exceeding 7200 mm (24 feet).
  4. Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
  5. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
  6. Fabricate joint covers of same thickness material as sheet metal served.
- C. Cleats:
1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
  2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
  3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.

4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

D. Edge Strips or Continuous Cleats:

1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.
2. Except as otherwise specified, fabricate edge strips of minimum 0.6 mm (0.024 inch) thick stainless steel or 1.25 mm (0.050 inch) thick aluminum.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using 0.8 mm (0.031 inch) thick stainless steel or 1.6 mm (0.0625 inch) thick aluminum.

E. Drips:

1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

F. Edges:

1. 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. Provide smooth-finished edges on all exposed flashing that does not received a hemmed 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.
3. Where copings and flashings will carry water onto cast stone, stone, or architectural concrete, use stainless steel.

## **2.5 FINISHES**

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
- C. Finish exposed metal surfaces as follows, unless specified otherwise:
  1. Stainless Steel: Finish No. 2B or 2D.
  2. Aluminum:
    - a. Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1 Architectural, 18 mm (0.7 mils) thick.
    - b. Colored Finish: AA-C22A42 (anodized) or AA-C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1 Architectural, 18 mm (0.7 mils) thick. Dyes will not be accepted.
    - c. Fluorocarbon Finish: AAMA 620, high performance organic coating.
    - d. Mill finish.
  4. Steel and Galvanized Steel:
    - a. Finish painted under Section 09 91 00, PAINTING unless specified as prefinished item.
    - b. Manufacturer's finish:
      - 1) Baked on prime coat over a phosphate coating.
      - 2) Baked-on prime and finish coat over a phosphate coating.
      - 3) Fluorocarbon Finish: AAMA 621, high performance organic coating.

## **2.6 THROUGH-WALL FLASHINGS**

- A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.
  1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
  2. Fabricate so keying nests at overlaps.
- B. For Masonry Work When Concealed Except for Drip:
  1. 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. For Flashing at Architectural Precast Concrete Panels or Stone Panels.
1. Use plane flat sheet of stainless steel.
  2. Form exposed portions with drip as specified or receiver.
- E. Window Sill Flashing and Lintel Flashing:
1. Use Stainless steel plane flat sheet or nonreinforced elastomeric sheeting.
  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.
- F. Door Sill Flashing:
1. Where concealed, use 0.5 mm (0.018 inch) thick stainless steel.
  2. Where shown on drawings as combined counter flashing under threshold, sill plate, door sill, or where subject to foot traffic, use either 0.6 mm (0.024 inch) stainless steel.
  3. Fabricate flashing at ends to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening with folded corners.

## **2.7 BASE FLASHING**

- A. Use metal base flashing at vertical surfaces intersecting built-up roofing without cant strips or where shown.
1. Use stainless steel, thickness specified unless specified otherwise.
  2. When flashing is over 250 mm (10 inches) in vertical height or horizontal width use 0.5 mm (0.018 inch) stainless steel.
  3. Use stainless steel at aluminum roof curbs where flashing contacts the aluminum.
  4. Use stainless steel at pipe flashings.
- B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).
- C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.

- D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.
- E. Pipe Flashing: (Other than engine exhaust or flue stack)
  - 1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
  - 2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
  - 3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
    - a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
    - b. Allow for loose fit around and into the pipe.
  - 4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
    - a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
    - b. Allow for loose fit around pipe.

## **2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)**

- A. Provide 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. Pipe Counterflashing:

1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
2. Fabricate 100 mm (4 inch) over lap at end.
3. Fabricate draw band of same metal as counter flashing. Use 0.33 mm (0.013 inch) thick stainless steel.
4. Use stainless steel bolt on draw band tightening assembly.
5. Vent pipe counter flashing may be fabricated to omit draw band and turn down 25 mm (one inch) inside vent pipe.

G. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

## 2.9 STOPS

A. General:

1. Fabricate in lengths not less than 2400 mm (8 feet) long and maximum of 3000 mm (10 feet).
2. Fabricate internal and external corners as one-piece with legs not less than 600 mm (2 feet) or more than 1200 mm (4 feet) long.
3. Fabricate roof flange not less than 100 mm (4 inches) wide.
4. Fabricate top edge to extend above roof not less than 25 mm (one inch).
5. Fabricate lower edge outward at an angle of 45 degrees to form drip and as fascia or as counter flashing as shown:
  - a. Fabricate of one-piece material of suitable width for fascia height of 250 mm (10 inch) maximum or counterflashing lap of not less than 100 mm (4 inch) over base flashing.
  - b. Fabricate bottom edge of formed fascia to receive edge strip.

- c. When fascia bottom edge forms counter flashing over roofing lap roofing not less than 150 mm (6 inches).
- B. Formed Flat Sheet Metal Stops and Fascia:
  - 1. Fabricate as shown of .05 mm (0.018 inch) thick stainless steel or 1.25 mm (0.050 inch) thick aluminum.
  - 2. When fascia exceeds 150 mm (6 inches) in depth, form one or more horizontal stops not less than 13 mm (1/2 inch) high in the fascia.
  - 3. Fabricate as two-piece fascia when fascia depth exceeds 250 mm (10 inches).
  - 4. At joint between ends of sheets, provide a concealed clip soldered or welded near one end of each sheet to hold the adjoining sheet in lapped position. The clip shall be approximately 100 mm (4 inches) wide and shall be the full depth of the fascia less 25 mm (one inch) at top and bottom. Clip shall be of the same thickness as the fascia.
  - 5. Provide edge strip as specified with lower hooked edge bent outward at an angle of 45 degrees.

## **2.10 REGLETS**

- A. Fabricate reglets of one of the following materials:
  - 1. Stainless steel, not less than 0.3 mm (0.012 inch) thick.
  - 2. Plastic coated extruded aluminum, not less than 1.4 mm (0.055 inch) thick prefilled with butyl rubber sealer and complete with plastic wedges inserted at 1000 mm (40 inches) on centers.
  - 3. Plastic, ASTM D1784, Type II, not less than 2 mm (0.075 inch) thick.
- B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.
- C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the concrete.
- D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.
- E. Fabricate mitered corners, fittings, and special shapes as may be required by details.
- F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

## **2.11 INSULATED EXPANSION JOINT COVERS**

- A. Either type optional, use only one type throughout.
- B. Types:



1. Construct of two preformed, stainless steel strips, not less than 0.4 mm (0.015 inch) thick, mechanically and adhesively bonded to both sides of a 2 mm (1/16 inch) thick neoprene or butyl sheet, or to a 0.4 mm (32 mil) thick reinforced chlorinated polyethylene sheet. Adhesively attach a 10 mm (3/8 inch) thick sheet of closed cell, neoprene foam insulation, to the underside of the neoprene, butyl, or chlorinated polyethylene sheet.
  2. Constructed of a 2 mm (1/16 inch) thick vinyl sheet, flanged at both sides with stainless steel strips not less than 0.4 mm (0.015 inch) thick. Vinyl sheet locked and encased by the stainless steel strip and prepunched for nailing. A 10 mm (3/8 inch) thick closed cell polyvinyl chloride foam insulating strip shall be heat laminated to the underside of the vinyl sheet between the stainless steel strips.
- C. Expansion joint covers shall have factory fabricated mitered corners, crossing tees, and other necessary accessories. Furnish in the longest available lengths.
- D. Metal flange of sufficient width to extend over the top of the curb and down curb sides 50 mm (2 inches) with hemmed edge for lock to edge strip.

## **2.12 ENGINE EXHAUST PIPE OR FLUE OR STACK FLASHING**

- A. Flashing at penetrations through roofing shall consist of a metal collar, sheet metal flashing sleeve and hood.
- B. Fabricate collar with roof flange of 1.2 mm (0.047 inch) minimum thick black iron or galvanized steel sheet.
1. Fabricate inside diameter of collar 100 mm (4 inches) larger than the outside diameter of the item penetration the roofing.
  2. Extend collar height from structural roof deck to not less than 350 mm (14 inches) above roof surface.
  3. Fabricate collar roof flange not less than 100 mm (4 inches) wide.
  4. Option: Collar may be of steel tubing 3 mm (0.125 inch) minimum wall thickness, with not less than four, 50 mm x 100 mm x 3 mm (2 inch by 4 inch by 0.125 inch) thick tabs bottom edge evenly spaced around tube in lieu of continuous roof flange. Full butt weld joints of collar.
- C. Fabricate sleeve base flashing with roof flange of either copper, stainless steel, or copper clad stainless steel.
1. Fabricate sleeve roof flange not less than 100 mm (4 inches) wide.
  2. Extend sleeve around collar up to top of collar.
  3. Flange bottom of sleeve out not less than 13 mm (1/24 inch) and soldered to 100 mm (4 inch) wide flange to make watertight.

4. Fabricate interior diameter 50 mm (2 inch) greater than collar.
- D. Fabricate hood counter flashing from same material and thickness as sleeve.
  1. Fabricate the same as pipe counter flashing except allow not less than 100 mm (4 inch) lap below top of sleeve and to form vent space minimum of 100 mm (4 inch) wide.
  2. Hem bottom edge of hood 13 mm (1/2 inch).
  3. Provide a 50 mm (2 inch) deep drawband.
- E. Fabricate insect screen closure between sleeve and hood. Secure screen to sleeve with sheet metal screws.

## **2.13 GOOSENECK ROOF VENTILATORS**

- A. Form of 1.3 mm (0.0508 inch) thick sheet aluminum, reinforce as necessary for rigidity, stiffness, and connection to curb, and to be watertight.
  1. Form lower-edge to sleeve to curb.
  2. Curb:
    - a. Form for 100 mm (4 inch) high sleeve to ventilator.
    - b. Form for concealed anchorage to structural curb and to bear on structural curb.
    - c. Form bottom edge of curb as counterflashing to lap base flashing.
- B. Provide open end with 1.6 mm (16 gage), stainless steel wire guard of 13 mm (1/2 inch) square mesh.
  1. Construct suitable aluminum angle frame to retain wire guard.
  2. Rivet angle frame to end of gooseneck.

## **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. 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.
7. 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.
8. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
9. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
10. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
11. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
12. 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.
13. 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.
14. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
15. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
16. Install sheet metal flashing and trim true to line, levels and slopes.
17. Install sheet metal flashing and trim to fit substrates and to result in water-tight performance.
18. Install exposed sheet metal flashing and trim with limited oil-canning and free of buckling and tool marks.
19. Torch cutting of sheet metal flashing and trim is not permitte.

### 3.2 THROUGH-WALL FLASHING

#### A. General:

1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.
2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches) and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.
8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
11. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
14. Continue flashing around columns:
  - a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.

- b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).
- B. Flashing at Top of Concrete Foundation Walls Where concrete is exposed. Turn up not less than 200 mm (8 inch) high and into masonry backup mortar joint or reglet in concrete backup as specified.
- C. Flashing at Top of Concrete Floors (except where shelf angles occur): Place flashing in horizontal masonry joint not less than 200 mm (8 inch) below floor slab and extend into backup masonry joint at floor slab 38 mm (1 1/2 inch).
- D. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint. At insulated metal panels, install per insulated metal wall panel manufacturer's written instructions. At glass fiber reinforced polymer concrete (GFRC) wall panels, install per GFRC manufacturer's written instruction.
- 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. At insulated metal panels, install per insulated metal panel manufacturer's written instructions.
  - 6. At glass fiber reinforced polymer concrete (GFRC) wall panels, install per GFRC manufacturer's written instructions.
  - 7. Coordinate with installation of waterproofing or asphalt felt for lap over top of flashing.
- F. Lintel Flashing when not part of shelf angle flashing:
  - 1. Install flashing full length of lintel to nearest vertical joint in masonry over veneer.
  - 2. Turn ends up 25 mm (one inch) and fold corners to form dam and extend end to face of wall.
  - 3. Turn back edge up to top of lintel; terminate back edge as specified for back-up wall.
- G. Window Sill Flashing:
  - 1. Install flashing to extend not less than 100 mm (4 inch) beyond ends of sill into vertical joint of masonry or veneer.
  - 2. Turn back edge up to terminate under window frame.
  - 3. Turn ends up 25 mm (one inch) and fold corners to form dam and extend to face of wall.

H. Door Sill Flashing:

1. Install flashing under bottom of plate sills of doors over curbs opening onto roofs. Extend flashing out to form counter flashing or receiver for counter flashing over base flashing. Set in sealant.
2. Extend sill flashing 200 mm (8 inch) beyond jamb opening. Turn ends up one inch in vertical masonry joint, extend end to face of wall. Join to counter flashing for water tight joint.
3. Where doors thresholds cover over waterproof membranes install sill flashing over waterproof membrane under thresholds. Extend beyond opening to cover exposed portion of waterproof membrane and not less than 150 mm (6 inch) beyond door jamb opening at ends. Turn up approximately 6 mm (1/4 inch) under threshold.

I. Flashing at Masonry, Stone, or Precast Concrete Copings:

1. Install flashing with drips on both wall faces unless shown otherwise.
2. Form penetration openings to fit tight against dowel or other item with edge turned up. Seal penetrations with sealant.

### **3.3 BASE FLASHING**

A. Install where roof membrane type base flashing is not used and where shown.

1. Install flashing at intersections of roofs with vertical surfaces or at penetrations through roofs, to provide watertight construction.
2. 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 STOPS**

- A. General:
  - 1. Install stops and fascias with allowance for expansion at each joint; minimum of 6 mm (1/4 inch).
  - 2. Extend roof flange of gravel stop and splice plates not less than four inches out over roofing and nail or screw to wood nailers. Space fasteners on 75 mm (3 inch) centers in staggered pattern.
  - 3. Install continuous cleat for fascia drip edge. Secure with fasteners as close to lower edge as possible on 75 mm (3 inch) centers.
  - 4. Where ends of stops and fascias abut a vertical wall, provide a watertight, flashed and sealant filled joint.
  - 5. Edge securement for low-slope roofs: Low-slope membrane roof systems metal edge securement, shall be designed in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined from Figure 1609, of IBC 2003.
- B. Sheet metal stops and fascia:
  - 1. Install with end joints of splice plates sheets lapped three inches.
  - 2. Hook the lower edge of fascia into a continuous edge strip.
  - 3. Lock top section to bottom section for two piece fascia.

### **3.7 COPINGS**

- A. General:
  - 1. On walls topped with a wood plank, install a continuous edge strip on the front and rear edge of the plank. Lock the coping to the edge strip with a 19 mm (3/4 inch) loose lock seam.
  - 2. Where shown turn down roof side of coping and extend down over base flashing as specified for counter-flashing. Secure counter-flashing to lock strip in coping at continuous cleat.



3. Install ends adjoining existing construction so as to form space for installation of sealants.  
Sealant is specified in Section 07 92 00, JOINT SEALANTS.

B. Aluminum Coping:

1. Install with 6 mm (1/4 inch) joint between ends of coping sections.
2. Install joint covers, centered at each joint, and securely lock in place.

C. Stainless Steel and Prefinished Metal Copings:

1. Join ends of sheets by a 19 mm (3/4 inch) locked and soldered seam, except at intervals of 9600 mm (32 feet), provide a 38 mm (1 1/2 inch) loose locked expansion joint filled with sealant or mastic.
2. At straight runs between 7200 mm (24 feet) and 19200 mm (64 feet) locate expansion joint at center.
3. At straight runs that exceed 9600 mm (32 feet) and form the leg of a corner locate the expansion joint not more than 4800 mm (16 feet) from the corner.

### **3.8 EXPANSION JOINT COVERS, INSULATED**

- A. Install insulated expansion joint covers at locations shown on curbs not less than 200 mm (8 inch) high above roof surface.
- B. Install continuous edge strips of same metal as expansion joint flange, nailed at not less than 75 mm (3 inch) centers.
- C. Install insulated expansion joint covers in accordance with manufacturer's directions locking edges to edge strips.

### **3.9 ENGINE EXHAUST PIPE OR STACK FLASHING**

- A. Set collar where shown and secure roof tabs or flange of collar to structural deck with 13 mm (1/2 inch) diameter bolts.
- B. Set flange of sleeve base flashing not less than 100 mm (4 inch) beyond collar on all sides as specified for base flashing.
- C. Install hood to above the top of the sleeve 50 mm (2 inch) and to extend from sleeve same distance as space between collar and sleeve beyond edge not sleeve:
  1. Install insect screen to fit between bottom edge of hood and side of sleeve.
  2. Set collar of hood in high temperature sealant and secure with one by 3 mm (1/8 inch) bolt on stainless steel draw band type, or stainless steel worm gear type clamp. Install sealant at top of head.

### **3.10 GOOSENECK ROOF VENTILATORS**

- A. Install on structural curb not less than 200 mm (8 inch) high above roof surface.

- B. Securely anchor ventilator curb to structural curb with fasteners spaced not over 300 mm (12 inch) on center.
- C. Anchor gooseneck to curb with screws having nonprene washers at 150 mm (6 inch) on center.

### **3.11 CLEANING AND PROTECTION**

- A. Clean exposed metal surfaces.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coatings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- E. Replace any sheet metal flashing and trim components that is damaged beyond repair to meet the satisfaction of the Resident Engineer.

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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 RELATED WORK**

Intumescent Fireproofing: Section 07 81 23, INTUMECENT FIREPROOFING

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Manufacturer's complete and detailed application instructions and specifications.
  - 2. Manufacturer's repair and patching instructions.
- C. Certificates:
  - 1. Certificate from testing laboratory attesting fireproofing material and application method meet the specified fire ratings.
    - a. List thickness and density of material required to meet fire ratings.
    - b. Accompanied by complete test report and test record.
  - 2. Manufacturer's certificate indicating sprayed-on fireproofing material supplied under the Contract is same within manufacturing tolerance as fireproofing material tested.
- D. Miscellaneous:
  - 1. Manufacturer's written approval of surfaces to receive sprayed-on fireproofing.
  - 2. Manufacturer's written approval of completed installation.
  - 3. Manufacturer's written approval of the applicators of fireproofing material.
- E. LEED Requirements:

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the

requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

### **1.5 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 from the site that have been exposed to water before installation.

### **1.6 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 Resident Engineer, 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.

### **1.7 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):

|                 |  |
|-----------------|--|
| C841-03(R2008)  | Installation of Interior Lathing and Furring   |
| C847-10         | Metal Lath   |
| E84-10          | Surface Burning Characteristics of Building Materials  |
| E119-10         | Fire Tests of Building Construction and Materials  |
| E605-93(R2006)  | Thickness and Density of Sprayed Fire-Resistive Materials<br>Applied to Structural Members   |
| E736-00(R2006)  | Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied<br>to Structural Members       |
| E759-92(R2005)  | The Effect of Deflection on Sprayed Fire-Resistive Material<br>Applied to Structural Members |
| E760-92(R2005)  | Impact on Bonding of Sprayed Fire-Resistive Material Applied<br>to Structural Members        |
| E761-92(R2005)  | Compressive Strength of Fire-Resistive Material Applied to<br>Structural Members             |
| E859-93(R2006)  | Air Erosion of Sprayed Fire-Resistive Materials Applied to<br>Structural Members             |
| E937-93(R2005)  | Corrosion of Steel by Sprayed Fire-Resistive Material Applied to<br>Structural Members       |
| E1042-02(R2008) | Acoustically, Absorptive Materials Applied by Trowel or Spray.                               |
| G21-09          | Determining Resistance of Synthetic Polymeric Materials to<br>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.

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<br>(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 48 kPa (1000psf).   |
| 7. | Surface Burning<br>Characteristics with adhesive<br>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 fire-proofing 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. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- D. 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. Lap and tie lath member in accordance with ASTM C841.

- E. Mix and apply in accordance with manufacturer's instructions.
  - 1. Mechanically control material and water ratios.
  - 2. Apply adhesive and sealer, when not an integral part of the materials, in accordance with the manufacturer's instructions.
  - 3. Apply to density and thickness indicated in UL Fire Resistance Directory, FM Approval Guide, or WH Certification Listings unless specified otherwise. Test in accordance with ASTM E119.
  - 4. Minimum applied dry density per cubic meter (cubic foot) for the underside of the walk on deck (interstitial) hung purl in or beam and steel deck, columns in interstitial spaces and mechanical equipment rooms shall be as follows:
    - a. Type I -  $240 \text{ kg/m}^3$  ( $15 \text{ lb/ft}^3$ ). Use in exposed areas not encased by subsequent construction, except where identified to receive application of intumescent fireproofing.
    - b. Type II -  $350 \text{ kg/m}^3$  ( $22 \text{ lb/ft}^3$ ). Use in areas encased by subsequent construction.
    - c. Materials with higher density of  $640 \text{ kg/m}^3$  ( $40 \text{ pcf}$ ) maybe used in some mechanical rooms.
- F. Application shall be completed in one area, inspected and approved by Resident Engineer before removal of application equipment and proceeding with further work.
- G. Cleaning: Immediately after completing spraying operations in each containable area of the Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

### **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. Resident Engineer 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.

### **3.3 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. Areas used as air handling plenums.
  - 4. Steel to be encased in concrete or designated to receive other type of fireproofing.
- B. Refer to the Code Data and Life Safety Plans in the Drawings for required locations and ratings of applied fireproofing.

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**SECTION 078123**  
**INTUMESCENT FIREPROOFING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes mastic and intumescent fire-resistive coatings (MIFRC).
- B. Related Requirements:
  - 1. Section 05 12 00, ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING
  - 2. Section 078100 "APPLIED FIREPROOFING" for sprayed fire-resistive materials (SFRM).

**1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

**1.3 REFERENCES**

- A. ASTM D 4541 - Bond Strength.
- B. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E 119 - Fire Tests of Building Construction and Materials.
- D. ASTM E605 – Test Method for Thickness and Density of Sprayed Fire-Resistant Material Applied to Structural Members.
- E. ASTM #736 – Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
- F. ASTM E760 – Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Materials Applied to Structural Members.
- G. U.L., Inc. - Fire Resistance Directory.
- H. SSPC-SP-1 Solvent Cleaning - Steel Structures Painting Council (SSPC).
- I. SSPC-SP-2 Hand Tool Cleaning - Steel Structures Painting Council (SSPC).
- J. SSPC-SP-3 Power Tool Cleaning - Steel Structures Painting Council (SSPC).
- K. SSPC-SP-6 Commercial Blast Cleaning - Steel Structures Painting Council (SSPC).

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. LEED Submittals:
  - 1. Product Data for Credit EQ 4.2: For paints and coatings, documentation including printed statement of VOC content.

2. Laboratory Test Reports for Credit EQ 4: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Samples: For each exposed product and for each color and texture specified.

## **1.5 INFORMATIONAL SUBMITTALS**

- A. General: Comply with the pertinent provisions of Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data: For each type of Product.
  1. Indicate product characteristics, performance, and limitation criteria
- C. Product certificates.
- D. Evaluation and Test reports.
- E. Field quality-control reports.
- F. Sample Warranties.

## **1.6 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.7 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five (5) years documented experience.
- B. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

## **1.8 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for fire resistance ratings.
- B. Submit certification of acceptability of fireproofing materials to authority having jurisdiction and to Resident Engineer.

## **1.9 MOCKUP**

- A. Provide mockup of applied intumescent fireproofing.
- B. Provide testing and analysis of mockup to manufacturer's published data.
- C. Apply sample section of 100 sq ft in size to representative substrate on site.
- D. Comply with project requirements as to thickness, density, fire rating, and finish texture.
- E. Examine installation to determine variances.
- F. If accepted, mockup will demonstrate minimum standard for the Work. Mockup may remain as part of the Work.

## **1.10 ENVIRONMENTAL REQUIREMENTS**

- A. When temperature is less than 40F, follow manufacturer's field instructions for cold weather installation. Do not apply when surface temperature is less than 5 degrees F above the dew point.
- B. Provide ventilation in areas to receive fireproofing during and 72 hours, minimum, after application, to dry materials and dissipate solvent odors.
- C. Maintain non-toxic, unpolluted working area. Provide temporary enclosure to prevent spray from contaminating air.

## **1.11 SEQUENCING AND SCHEDULING**

- A. Sequence work in conjunction with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

## **1.12 WARRANTY**

- A. Provide one year manufacturer's warranty.
- B. Provide one year applicator's warranty.
- C. Warranty: Fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering. Reinstall or repair such defects or failures.

# **PART 2 - PRODUCTS**

## **2.1 MATERIALS, GENERAL**

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

- B. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- C. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction and the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Flat Paints and Coatings: 50 g/L.
  - 2. Nonflat Paints and Coatings: 150 g/L.
  - 3. Primers, Sealers, and Undercoaters: 200 g/L.
  - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
  - 5. Fireproofing Exterior Coatings: 350 g/L.
- D. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Asbestos: Provide products containing no detectable asbestos.

## **2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS**

- A. MIFRC Materials: Manufacturer's standard, factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with indicated fire-resistance design.
  - 1. Application: Designated for "conditioned interior space purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
  - 3. Surface-Burning Characteristics: Flame-spread and smoke-developed indexes of 25 and 50, respectively, or less according to ASTM E 84.
  - 4. Bond Strength: ANSI/ASTM E736.
  - 5. Bond Impact: ASTM E760, no cracking, flaking, or delamination.
  - 6. Dry Density: ASTM #605.
  - 7. Finish: Rolled, uniform textured finish as required to provide a smooth finish appearance without "grain" or "direction".

- a. Color and Gloss: As selected by Resident Engineer from manufacturer's full range.

## **2.3 AUXILIARY MATERIALS**

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer.
- C. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION**

- A. Verify that surfaces are ready to receive work.
- B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.
- C. Verify ducts, piping, equipment, or other items which would interfere with application of fireproofing are not positioned until fireproofing work is complete.
- D. Verify that voids and cracks in substrate are filled, and projections are removed where fireproofing is exposed to view as a finish material.
- E. Verify that ductwork in areas where fireproofing is being applied is closed off and sealed.
- F. Beginning of installation means applicator accepts existing substrate.

### **3.2 PREPARATION**

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrate of dirt, dust, grease, oil, loose material, or other matter which may effect bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing.

### **3.3 APPLICATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and

according to each fire-resistance design. Verify that objects penetrating fireproofing are securely attached to substrates and that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

- B. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- C. Apply primer fireproofing in accordance with manufacturer's written instructions. Do not apply to surfaces which would prohibit proper adhesions.
- D. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer. Note that finish appearance is to be smooth and free of texture, "grain" or "direction".
- E. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- F. Finishes: Apply fireproofing to produce the following finishes:
  - 1. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness. Provide a finish appearance that is smooth and free of texture, "grain" or "direction".

### **3.4 FIELD QUALITY CONTROL**

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
  - 1. Test and inspect as required by the IBC, 1704.11.
- B. Fireproofing will be considered defective if it does not pass tests and inspections.
  - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
  - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- C. Prepare test and inspection reports.

### **3.5 CLEANING AND REPAIRING**

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

- B. Repair fireproofing damaged by other work before concealing it with other construction.
- C. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

- - - END - -



## **SECTION 07 84 00 FIRESTOPPING**

### **PART 1 GENERAL**

#### **1.1 DESCRIPTION**

- A. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Closure of openings in walls against penetration of gases or smoke in smoke partitions.

#### **1.2 RELATED WORK**

- A. Expansion and seismic joint firestopping: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
- B. Spray applied fireproofing: Section 07 81 00, APPLIED FIREPROOFING
- C. Spray Applied Intumescent Fireproofing: Section 07 81 23, INTUMESCENT FIREPROOFING
- D. Sealants and application: Section 07 92 00, JOINT SEALANTS.
- E. Joint Firestopping: Section 07 84 46, FIRE RESISTIVE JOING SYSTEMS
- F. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS and Section 23 37 00, AIR OUTLETS AND INLETS.

#### **1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- C. List of FM, UL, or WH classification number of systems installed.
- D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.
- E. Installer Certificates: From Installer indicating penetration firstopping has been installed in compliance with requirements and manufacturer's written recommendations.

#### **1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the

requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.5 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.

## **1.6 WARRANTY**

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

## **1.7 QUALITY ASSURANCE**

- A. FM, UL, or WH or other approved laboratory tested products will be acceptable.
- B. Pre-Installation Conference: Conduct conference at Project Site.

## **1.8 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):  
E84-10 Surface Burning Characteristics of Building Materials  
E814-11 Fire Tests of Through-Penetration Fire Stops
- C. Factory Mutual Engineering and Research Corporation (FM):  
Annual Issue Approval Guide Building Materials
- D. Underwriters Laboratories, Inc. (UL):  
Annual Issue Building Materials Directory  
Annual Issue Fire Resistance Directory  
1479-10 Fire Tests of Through-Penetration Firestops
- E. Warnock Hersey (WH):  
Annual Issue Certification Listings

## **PART 2 - PRODUCTS**

### **2.1 FIRESTOP SYSTEMS**

- A. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.

- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 100 mm (4 in) nominal pipe or 0.01 m<sup>2</sup> (16 sq. in.) in overall cross sectional area.
- C. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.
- D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
  - 1. Contain no flammable or toxic solvents.
  - 2. Have no dangerous or flammable out gassing during the drying or curing of products.
  - 3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
  - 4. When used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
  - 5. Above-ceiling sealants shall be red in color.
- 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.
- I. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

## **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. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Remove dirt, grease, oil, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.
- C. 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.
- D. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- E. Install fill materials for firestopping by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

- 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- F. Where deficiencies are found or penetration firestopping is damaged or removed because of construction practices and activities, repair or replace penetration firestopping to comply with requirements.
- G. Proceed with enclosing penetration firestopping with other construction only after installations comply with requirements.

#### **3.4 CLEAN-UP AND ACCEPTANCE OF WORK**

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Do not move materials and equipment to the next-scheduled work area until completed work is inspected and accepted by the Resident Engineer.
- C. Clean up spills of liquid type materials.

- - - E N D - - -

**SECTION 07 84 46**  
**FIRE-RESISTIVE JOINT SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Joints in or between fire-resistance-rated constructions.
  - 2. Joints at exterior curtain-wall/floor intersections.
  - 3. Joints in smoke barriers.

**1.2 RELATED WORK**

- A. Expansion and seismic Joint Firestopping: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
- B. Spray Applied Fireproofing: Section 07 81 00, APPLIED FIREPROOFING
- C. Spray Applied Intumescent Fireproofing: Section 07 81 23, INTUMESCENT FIREPROOFING
- D. Closures in Opening within Construction:: Section 07 84 00, FIRESTOPPING.
- E. Joint Firestopping: Section 07 84 46, FIRE RESISTIVE JOING SYSTEMS
- F. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS and Section 23 37 00, AIR OUTLETS AND INLETS.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
  - 1. Product Data for Credit IEQ 4.1: For fire-resistive joint system sealants, documentation including printed statement of VOC content.
  - 2. Laboratory Test Reports for Credit IEQ 4: For fire-resistive joint system sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

**1.4 INFORMATIONAL SUBMITTALS**

- A. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
- B. Product test reports.

## **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.6 QUALITY ASSURANCE**

- A. Preinstallation Conference: Conduct conference at [Project site] <Insert location>.

## **PART 2 - PRODUCTS**

### **2.1 FIRE-RESISTIVE JOINT SYSTEMS**

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Ratings determined per ASTM E 1966 or UL 2079:
  - 1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
- C. Joints at Exterior Curtain-Wall/Floor Intersections: Rating determined by ASTM E 119 based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa) or ASTM E 2307.
  - 1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- D. Joints in Smoke Barriers: Ratings determined per UL 2079.
  - 1. L-Rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30 inch wg (74.7 Pa) at both ambient and elevated temperatures.

- E. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84. Provide products capable of being sanded and finished with similar surface treatments as used on surrounding wall or floor surface.
- F. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Architectural Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- G. Low-Emitting Materials: Fire-resistive joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- H. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- D. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.



2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### **3.2 FIELD QUALITY CONTROL**

- A. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.
- B. Proceed with enclosing fire-resistive joint systems with other construction only after installations comply with requirements.

- - - END - - -

## **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. Fire Resistive Joints: Section 07 84 46, FIRE-RESISTIVE JOINT SYSTEMS
- E. Glazing: Section 08 80 00, GLAZING.
- F. Glazed Storefront Entry Systems: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
- G. Glazed aluminum curtain wall: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
- H. Sound rated gypsum partitions/sound sealants: Section 09 29 00, GYPSUM BOARD.
- I. Mechanical Work: Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSION; Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING; Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.

#### **1.3 QUALITY CONTROL:**

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
  - 1. Testing Agency Qualifications: An independent testing agency 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 other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

- D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:
  - 1. Locate test joints where indicated or, if not indicated, as directed by Resident Engineer.
  - 2. Conduct field tests for each application indicated below:
    - a. Each type of elastomeric sealant and joint substrate indicated.
    - b. Each type of non-elastomeric sealant and joint substrate indicated.
  - 3. Notify Resident Engineer seven days in advance of dates and times when test joints will be erected.
  - 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
- E. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.
- F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
  - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this section.

#### **1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.
- D. Manufacturer's Literature and Data:
  - 1. Caulking compound
  - 2. Primers
  - 3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- E. Sample Warranties

#### **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the

requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.6 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.

#### **1.7 DELIVERY, HANDLING, AND STORAGE:**

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures exceeding 32° C (90° F) or less than 5° C (40° F).

#### **1.8 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.

#### **1.9 WARRANTY:**

- A. Warranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Warranty of Construction", Article specified in Section 00 72 00, GENERAL CONDITIONS, except that warranty period shall be extended to two years.

- B. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

#### **1.10 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 Society for Testing and Materials (ASTM):

C612-10 .....Mineral Fiber Block and Board Thermal Insulation.

C717-10 .....Standard Terminology of Building Seals and Sealants.

C834-10 .....Latex Sealants.

C919-08. ....Use of Sealants in Acoustical Applications.

C920-10 .....Elastomeric Joint Sealants.

C1021-08 .....Laboratories Engaged in Testing of Building Sealants.

C1193-09 .....Standard Guide for Use of Joint Sealants.

C1330-02 (R2007) .....Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

D1056-07 .....Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.

E84-09.....Surface Burning Characteristics of Building Materials.

- C. Sealant, Waterproofing and Restoration Institute (SWRI).

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### **PART 2 - PRODUCTS**

#### **2.1 SEALANTS:**

- A. S-1:

1. ASTM C920, polyurethane or polysulfide.
2. Type M.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 20-40

- B. S-2:

1. ASTM C920, polyurethane or polysulfide.
2. Type M.
3. Class 25.

4. Grade P.
  5. Shore A hardness of 25-40.
- C. S-3:
1. ASTM C920, polyurethane or polysulfide.
  2. Type S.
  3. Class 25, joint movement range of plus or minus 50 percent.
  4. Grade NS.
  5. Shore A hardness of 15-25.
  6. Minimum elongation of 700 percent.
- D. S-4:
1. ASTM C920 polyurethane or polysulfide.
  2. Type S.
  3. Class 25.
  4. Grade NS.
  5. Shore A hardness of 25-40.
- E. S-5:
1. ASTM C920, polyurethane or polysulfide.
  2. Type S.
  3. Class 25.
  4. Grade P.
  5. Shore hardness of 15-45.
- F. S-6:
1. ASTM C920, silicone, neutral cure.
  2. Type S.
  3. Class: Joint movement range of plus 100 percent to minus 50 percent.
  4. Grade NS.
  5. Shore A hardness of 15-20.
  6. Minimum elongation of 1200 percent.
- G. S-7:
1. ASTM C920, silicone, neutral cure.
  2. Type S.
  3. Class 25.
  4. Grade NS.
  5. Shore A hardness of 25-30.

6. Structural glazing application.

H. S-8:

1. ASTM C920, silicone, acetoxo cure.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Structural glazing application.

I. S-9:

1. ASTM C920 silicone.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Non-yellowing, mildew resistant.

J. S-10:

1. ASTM C920, coal tar extended fuel resistance polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 15-20.

K. S-11:

1. ASTM C920 polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 35 to 50.

L. S-12:

1. ASTM C920, polyurethane.
2. Type M/S.
3. Class 25, joint movement range of plus or minus 50 percent.
4. Grade P/NS.
5. Shore A hardness of 25 to 50.

## **2.2 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.

## **2.8 MASKING TAPE:**

Non-Staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION:**

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

### **3.2 PREPARATIONS:**

- A. Prepare joints in accordance with manufacturer's instructions and SWRI.
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
  - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
  - 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.

- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
  - 1. Apply primer prior to installation of back-up rod or bond breaker tape.
  - 2. Use brush or other approved means that will reach all parts of joints.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

### **3.3 BACKING INSTALLATION:**

- A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
- D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.
- E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

### **3.4 SEALANT DEPTHS AND GEOMETRY:**

- A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.
- B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

### **3.5 INSTALLATION:**

- A. General:
  - 1. Apply sealants and caulking only when ambient temperature is between 5° C and 38° C (40° and 100° F).

2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
  3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
  4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
  5. Avoid dropping or smearing compound on adjacent surfaces.
  6. Fill joints solidly with compound and finish compound smooth.
  7. Tool joints to concave surface unless shown or specified otherwise.
  8. Finish paving or floor joints flush unless joint is otherwise detailed.
  9. Apply compounds with nozzle size to fit joint width.
  10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.
- B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.
- C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.
1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
  2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
  3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
  4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
  5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

### **3.6 FIELD QUALITY CONTROL:**

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as recommended by sealant manufacturer:
1. Extent of Testing: Test completed elastomeric sealant joints as follows:
    - a. Perform 10 tests for first 300 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.

- b. Perform one test for each 300 m (1000 feet) of joint length thereafter or one test per each floor per elevation.
- B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- C. Inspect tested joints and report on following:
  - 1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
  - 2. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
  - 3. Whether sealants filled joint cavities and are free from voids.
  - 4. Whether sealant dimensions and configurations comply with specified requirements.
- D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure 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 Metal: Type S-1, S-2
  - 2. Metal to Masonry or Stone: Type S-1
  - 3. Masonry to Masonry or Stone: Type S-1
  - 4. Stone to Stone: Type S-1
  - 5. Cast Stone to Cast Stone: Type S-1

6. Threshold Setting Bed: Type S-1, S-3, S-4
  7. Masonry Expansion and Control Joints: Type S-6
  8. Wood to Masonry: Type S-1
- B. Metal Reglets and Flashings:
1. Flashings to Wall: Type S-6
  2. Metal to Metal: Type S-6
- C. Sanitary Joints:
1. Walls to Plumbing Fixtures: Type S-9
  2. Counter Tops to Walls: Type S-9
  3. Pipe Penetrations: Type S-9
- D. Horizontal Traffic Joints:
1. Concrete Paving, Unit Pavers: Type S-11 or S-12
  2. Garage/Parking Decks: Type S-10
- E. High Temperature Joints over 204 degrees C (400 degrees F):
1. Exhaust Pipes, Flues, Breech Stacks: Type S-7 or S-8
- F. Interior Caulking:
1. Typical Narrow Joint 6 mm, (1/4 inch) or less at Walls and Adjacent Components: Types C-1, C-2 and C-3.
  2. Perimeter of Doors, Windows, Access Panels which Adjoin Concrete or Masonry Surfaces: Types C-1, C-2 and C-3.
  3. Joints at Masonry Walls and Columns, Piers, Concrete Walls or Exterior Walls: Types C-1, C-2 and C-3.
  4. Perimeter of Lead Faced Control Windows and Plaster or Gypsum Wallboard Walls: Types C-1, C-2 and C-3.
  5. Exposed Isolation Joints at Top of Full Height Walls: Types C-1, C-2 and C-3.
  6. Exposed Acoustical Joint at Sound Rated Partitions Type C-2.
  7. Concealed Acoustic Sealant Type S-4, C-1, C-2 and C-3.

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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 seismic and building expansion joint assemblies.
- B. Types of assemblies:
  - Metal Plate Cover
  - Elastomeric Joint Covers
  - Preformed Elastomeric Sealant Joint

**1.2 RELATED WORK**

- A. Sheet Metal Expansion Joint Seals: Section 07 60 00, FLASHING AND SHEET METAL.
- B. Color of Elastomer Inserts, Filler Strips, Exterior Wall Seals and Metal Finishes: Section 09 06 00, SCHEDULE FOR FINISHES
- C. 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 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.7 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-08.....Structural Steel
  - A167-99 (R2009) .....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
  - A283/A283M-07.....Low and Intermediate Tensile Strength Carbon Steel Plates
  - A786/A786M-05(R2009) .....Rolled Steel Floor Plates
  - B209M-07.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

- B221M-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,  
Shapes, and Tubes (Metric)
- C864-05 .....Dense Elastomeric Compression Seal Gaskets, Setting Blocks,  
and Spacers
- C920-11 .....Elastomeric Joint Sealants
- D1187-97 (R2002).....Asphalt Base Emulsions for Use as Protective Coatings for  
Metal
- D2287-96 (R2010).....Non-rigid Vinyl Chloride Polymer and Copolymer Molding and  
Extrusion Compounds
- E119-10.....Fire Tests of Building Construction and Materials
- E814-11.....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):
  - 251-06 .....Tests of Fire Endurance of Building Construction and Materials
- F. Underwriters Laboratories Inc. (UL):
  - 263-11 .....Fire Tests of Building Construction and Materials

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Stainless Steel:
  - 1. ASTM A167, Type 302 or 304.
  - 2. To be used at seismic joints and at non-traffic joints over 100mm (4-inches) wide.
- B. Structural Steel Shapes: ASTM A36.
- C. Steel Plate: ASTM A283, Grade C.
- D. Rolled Steel Floor Plate:
  - 1. ASTM A786.
  - 2. To be used at traffic joints where wheel loads exceed 136 Kg (300 lbs).
- E. Aluminum:
  - 1. Extruded: ASTM B221, alloy 6063-T5.
  - 2. Plate and Sheet: ASTM B209, alloy 6061-T6.
  - 3. To be used at non-seismic joints, joints less than 100mm (4-inches) wide and where wheel loads are less than 136 Kg (300 lbs).



F. Elastomeric Sealant:

1. ASTM C920, polyurethane.
2. Type.
3. Class 25.
4. Grade P or NS.
5. Shore A hardness 25, unless specified otherwise.

G. Thermoplastic Rubber:

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

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

I. 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.

J. Zinc-Molybdate Primer: Fed. Spec. TT-P-645.

K. 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.
  10. Seismic Performance: Expansion Control Systems shall withstand the effects of earthquake motions determined according to ASCE/SEI7.
  11. Source Limitations: Obtain expansion control systems from a single source from a single manufacturer.
- B. Floor-to-Floor Metal Plate Joints:
1. Frames on each side of joint designed to support cover plate of design shown.
    - a. Continuous frame designed to finish flush with adjacent floor of profile indicated with seating surface and raised floor rim to accommodate flooring.
    - b. Provide concealed bolt and steel anchors for embedment in concrete.
    - c. Designed for filler materials between raised rim of frame and edge of cover plate where shown.

- d. Frame and cover plates of some metal where exposed.
  - 1) Design cover plates to support 180 Kg (400 lbs) per 0.3 square meters (1-square foot).
  - 2) Cover plates free of rattle due to traffic.
  - 3) No gaps or budes occur on filler material during design movement of joint.
  - 4) Provide manufacturer's continuous standard flexible vinyl water stop under floor joint cover assemblies.
- C. 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.
  - 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.
  - 4. Match cover of adjacent floor to floor cover.
- D. Interior Wall Joint Cover Assemblies:
  - 1. Surface Mounted Metal Cover Plates:
    - a. Concealed frame for fastening to wall on one sides of joint.
    - b. Extend cover to lap each side of joint and to permit free movement on one side.
    - c. Provide concealed attachment of cover to frame 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:
  - 1. Variable movement with seal designed to prevent water and air infiltration.
  - 2. Use vinyl seal strip as secondary seal behind primary seal.
  - 3. Cover Plate Assemblies:
    - a. Surface mounted cover plate.
    - b. Concealed frame for fastening to wall on one side of joint.
    - c. Extend cover to lap each side of joint and to permit free movement on one side.
    - d. Provide concealed attachment of cover to frame for cover with cover in close contact with adjacent finish surfaces.
    - e. Use angle cover plate of intersection of walls.
  - 4. Extruded thermoplastic rubber joint assemblies.

- a. Aluminum frames both sides of joint.
    - 1) Designed to receive flexible rubber primary seal on exposed face after installation of frame.
    - 2) Designed to receive continuous secondary vinyl sheet seal.
    - 3) Anchor spaced at ends and not over 600 mm (24-inches).
  - b. Variable movement extruded rubber primary seal designed to remain in aluminum frame, throughout movement of joint.
    - 1) Flush mounted seal minimum 3 mm (0.125-inch) thick with dual movement grooves designed for plus or minus 50 percent, movement of joint width.
    - 2) Seismic seal minimum 3 mm (0.125-inch) thick with multi-movement grooves designed for plus or minus 100 percent movement of joint width.
    - 3) Recessed front face seal minimum 3 mm (0.125-inch) thick with no movement grooves, designed for plus or minus 50 percent movement of joint width.
  - c. Provide factory heat welded transitions where directional changes occur to ensure a watertight system.
  - d. Provide pantographic wind load supports, maximum 2400 mm (8 feet) on center to support seal systems of 300 mm (12-inches) and wider.
- E. 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 locked into metal frame.
  - 4. Vinyl and metal finish as specified in section 09 06 00, SCHEDULE FOR FINISHES.
  - 5. Vinyl insert semi rigid either flush face or accordion shape as showed to span joint width without sagging.
- F. Preformed Sealant Joint: Factory installed elastomeric sealant between extruded aluminum angle frame both sides.
- 1. Elastomeric Sealant: Two part polyurethane sealant with movement capability of +/- 25% of joint width per ASTM-C-920, Type M, Grade P, Class 25, Shore A hardness of 25+/-5.
    - a. Color: To be selected from manufacturer's standard colors.
  - 2. Frame: Extruded Aluminum: Clear anodized.
  - 3. Anticipated movement: (+/- 1-inch).

## **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.
    - b. Color anodized finish: AA-C22A44 Chemically etched medium matte, electrolytically deposited metallic compound, Class I Architectural, 0.7-mil thick finish. Dyes not accepted.
  2. Fluorocarbon Finish: NAAMM AMP 503 AAMA 605.2, high performance organic coating.
  3. Factory-Primed Concealed Surface: NAAMM AMP 505 Protect concealed aluminum surfaces that will be in contact with plaster, concrete or masonry surfaces when installed by applying a shop coat of zinc-molybdate primer to contact surfaces. Provide minimum dry film thickness of 2.0 mils.
- C. Stainless Steel: NAAMM AMP 503, finish No. 2B.
- D. Carbon Steel: NAAMM AMP 504, Galvanized 690.

## **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**

A. Take proper precautions to protect the expansion joint covers from damage after they are in place.

B. Cover floor joints with plywood where wheel traffic occurs.

--- E N D ---

**SECTION 08 11 13**  
**HOLLOW METAL DOORS AND FRAMES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies steel doors, steel frames and related components.
- B. Terms relating to steel doors and frames as defined in ANSI A123.1 and as specified.

**1.2 RELATED WORK**

- A. Frames fabricated of structural steel: Section 05 50 00, METAL FABRICATIONS.
- B. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- C. Aluminum Frames Entrance Work: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
- D. Automatic Entrance Work: Section 08 71 13, AUTOMATIC DOOR OPENERS.
- E. Overhead doors including loading docks: Section 08 33 00, COILING DOORS AND GRILLES.
- F. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- G. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- H. Card readers and biometric devices: Section 28 13 00, ACCESS CONTROL.
- I. Intrusion Alarm: Section 28 16 11, INTRUSION DETECTION SYSTEM.

**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.

**1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the



requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™  
CERTIFICATION.

**1.6 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.

**1.7 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.

**1.8 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. Door and Hardware Institute (DHI):
  - A115 Series.....Steel Door and Frame Preparation for Hardware, Series A115.1 through A115.17 (Dates Vary)
- C. 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
- D. American Society for Testing and Materials (ASTM):
  - A568/568-M-07 .....Steel, Sheet, Carbon, and High-Strength, Low-alloy, Hot-Rolled and Cold-Rolled
  - A653-11 .....Standard for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galmannealed) by the Hot-Dip Process.
  - A1008-08 .....Steel, sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability
  - D1621-04 .....Compressive Properties of Rigid Cellular Plastics

- E. The National Association Architectural Metal Manufacturers (NAAMM):  
Metal Finishes Manual (1988 Edition)
- F. National Fire Protection Association (NFPA):  
80-09 .....Fire Doors and Fire Windows
- G. Underwriters Laboratories, Inc. (UL):  
Fire Resistance Directory
- H. 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. Prime Paint: Paint that meets or exceeds the requirements of A250.8.

### **2.2 FABRICATION GENERAL**

- A. GENERAL:
  - 1. Follow SDI A250.8 for fabrication of standard steel doors, except as specified otherwise. Doors to receive hardware specified in Section 08 71 00, DOOR HARDWARE. Tolerances as per SDI A250.8. Thickness, 44 mm (1-3/4 inches), unless otherwise shown.
  - 2. Close top edge of exterior doors flush and seal to prevent water intrusion.
  - 3. When vertical steel stiffeners are used for core construction, fill spaces between stiffeners with mineral fiber insulation.
- B. Heavy Duty Doors: SDI A250.8, Level 2, Model 2 of size and design shown. Core construction types a, d, or f, for interior doors, and, types b, c, e, or f, for exterior doors.
- C. Extra Heavy Duty Doors: SDI A250.8, Level 3, Model 2 of size and design shown. Core construction Types d or f, for interior doors, and Types b, c, e, or f, for exterior doors. Use for stairwell doors and security doors. See additional requirements for detention doors, under paragraph "Custom Hollow Metal 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 E2074, or latest applicable testing method.
5. Fire Performance Rating:
  - a. "B" label, 1-1/2 hours.
  - b. "C" label, 3/4 hour.

## **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 A653.
3. Frames for labeled fire rated doors and windows.
  - a. Comply with NFPA 80. Test by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual.
  - b. Fire rated labels of approving laboratory permanently attached to frames as evidence of conformance with these requirements. Provide labels of metal or engraved stamp, with raised or incised markings.
4. Frames for lead-lined doors:
  - a. Frames for doors 900 mm (3 feet) or less in width and having lead lining of 1 mm or less in thickness, and not shown to have structural steel supports: Minimum 1.7 mm (0.067 inch) thick.
  - b. Frames for doors over 900 mm (3 feet) in width or having lead-lining more than 1 mm in thickness shown to be supported by and attached to structural steel subframes: Minimum 1.3 mm (0.053 inch) thick.
  - c. Lead-lining and its application are specified in Section 13 49 00, RADIATION PROTECTION.

5. Frames for doors specified to have automatic door operators; Security doors (Type 36); service window: minimum 1.7 mm (0.067 inch) thick.
  6. 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 of the same material as the frames securely fastened to back of hardware reinforcements except on lead-lined frames.
  3. Where concealed door closers are installed within the head of the door frames, prepare frames for closers and provide 1 mm (0.042 inch) thick steel removable stop sections for access to concealed face plates and control valves, except when cover plates are furnished with closer.
- C. Glazed Openings:
- a. Integral stop on exterior, corridor, or secure side of door.
  - b. Design rabbet width and depth to receive glazing material or panel shown or specified.
- D. Frame Anchors:
1. Floor anchors:
    - a. Where floor fills occur, provide extension type floor anchors to compensate for depth of fill.
    - b. At bottom of jamb use 1.3 mm (0.053 inch) thick steel clip angles welded to jamb and drilled to receive two 6 mm (1/4 inch) floor bolts. Use 50 mm x 50 mm (2 inch by 2 inch) 9 mm by (3/8 inch) clip angle for lead lined frames, drilled for 9 mm (3/8 inch) floor bolts.
    - c. Where mullions occur, provide 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two 6 mm (1/4 inch) floor bolts and frame anchor screws.
    - d. Where sill sections occur, provide continuous 1 mm (0.042 inch) thick steel rough bucks drilled for 6 mm (1/4 inch) floor bolts and frame anchor screws. Space floor bolts at 50 mm (24 inches) on center.
  2. Jamb anchors:
    - a. Locate anchors on jambs near top and bottom of each frame, and at intermediate points not over 600 mm (24 inches) apart, except for fire rated frames space anchors as required by labeling authority.
    - b. Form jamb anchors of not less than 1 mm (0.042 inch) thick steel unless otherwise specified.

- c. Anchors set in masonry: Use adjustable anchors designed for friction fit against the frame and for extension into the masonry not less than 250 mm (10 inches). Use one of following type:
  - 1) Wire loop type of 5 mm (3/16 inch) diameter wire.
  - 2) T-shape or strap and stirrup type of corrugated or perforated sheet steel.
- d. Anchors for stud partitions: Either weld to frame or use lock-in snap-in type. Provide tabs for securing anchor to the sides of the studs.
- e. Anchors for frames set in prepared openings:
  - 1) Steel pipe spacers with 6 mm (1/4 inch) inside diameter welded to plate reinforcing at jamb stops or hat shaped formed strap spacers, 50 mm (2 inches) wide, welded to jamb near stop.
  - 2) Drill jamb stop and strap spacers for 6 mm (1/4 inch) flat head bolts to pass thru frame and spacers.
- f. Anchors for observation windows and other continuous frames set in stud partitions.
  - 1) In addition to jamb anchors, weld clip anchors to sills and heads of continuous frames over 1200 mm (4 feet) long.
  - 2) Anchors spaced 600 mm (24 inches) on centers maximum.
- g. Modify frame anchors to fit special frame and wall construction and provide special anchors where shown or required.

## **2.4 TRANSOM PANELS**

- A. Fabricate panels as specified for flush doors.
- B. Fabricate bottom edge with rabbet stop to fit top of door where no transom bar occurs.

## **2.5 SHOP PAINTING**

- A. 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.
6. Install frames at fire-rated openings according to NFPA 80.

**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.

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

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

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

Install doors and hardware as specified in Sections Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 14 00, WOOD DOORS, and Section 08 71 00, DOOR HARDWARE.

### **3.3 ADJUSTING AND CLEANING**

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

---END---

**SECTION 08 14 00**  
**INTERIOR WOOD DOORS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies interior solid core flush 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. Overhead doors including loading docks: Section 08 33 00, COILING DOORS AND GRILLES.
- C. Door hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- D. Installation of doors and hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 14 00, WOOD DOORS, or Section 08 71 00, DOOR HARDWARE.
- E. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- F. Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- G. Card readers and biometric devices: Section 28 13 00, ACCESS CONTROL
- H. Intrusion alarm: Section 28 16 11, INTRUSION DETECTION SYSTEM

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
  - 1. Corner section of flush veneered door 300 mm (12 inches) square, showing details of construction, labeled to show grade and type number and conformance to specified standard.
  - 2. Veneer sample 200 mm (8 inch) by 275 mm (11 inch) by 6 mm (1/4 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is specified.
- 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 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. 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 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.5 WARRANTY**

- A. Doors are subject to terms of Article titled "Warranty of Construction" of Section 00 72 00, GENERAL CONDITIONS, except that warranty shall be as follows:
  1. For interior doors, manufacturer's warranty for lifetime of original installation.

#### **1.6 DELIVERY AND STORAGE**

- A. Factory seal doors and accessories in minimum of 6 mill polyethylene bags or cardboard packages which shall remain unbroken during delivery and storage.
- B. Store in accordance with WDMA I.S.1-A, J-1 Job Site Information.
- C. Label package for door opening where used.

#### **1.7 APPLICABLE PUBLICATIONS**

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

- B. Window and Door Manufacturers Association (WDMA):
 

|                  |   |
|------------------|---|
| I.S.1-A-04 ..... | Architectural Wood Flush 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                    |

- C. National Fire Protection Association (NFPA):
  - 80-07 .....Protection of Buildings from Exterior Fire
  - 252-08 .....Fire Tests of Door Assemblies
- D. ASTM International (ASTM):
  - E2074-00.....Standard Test Method for Door Assemblies or Current  
Applicable Test Method.

## **PART 2 - PRODUCTS**

### **2.1 FLUSH DOORS**

- A. General:
  - 1. Meet requirements of WDMA I.S.1-A, Extra Heavy Duty.
  - 2. Adhesive: Type II
  - 3. Thickness: 45 mm (1-3/4 inches) unless otherwise shown or specified.
- B. Face Veneer:
  - 1. In accordance with WDMA I.S.1-A.
  - 2. One species throughout the project unless scheduled or otherwise shown.
  - 3. For transparent finishes: Premium Grade, rotary cut, white oak.
    - a. AA grade face veneer
    - b. Match face veneers for doors for uniform effect of color and grain at joints.
    - c. Door edges shall be same species as door face veneer.
    - d. In existing buildings, where doors are required to have transparent finish, use wood species and grade of face veneers to match adjacent existing doors.
  - 4. Factory sand doors for factory finishing.
  - 5. Factory finish both faces, tops and bottoms, and both edges of 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.
  - 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 comply with NFPA 80 and 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.
  - c. Where continuous hinges are used, provide appropriate label.
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 pairs 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 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.

**2.3 IDENTIFICATION MARK:**

- A. On top edge of door, unless visible from above.
- B. Either a stamp, brand or other indelible mark, giving manufacturer's name, door's trade name, construction of door, code date of manufacture and quality.
- C. Accompanied by either of the following additional requirements:
  1. An identification mark or a separate certification including name of inspection organization.
  2. Identification of standards for door, including glue type.
  3. Identification of veneer and quality certification.
  4. Identification of preservative treatment for stile and rail doors.

**2.4 SEALING:**

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 bottoms of 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 and 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 both edges of the doors smooth to touch.
- H. Apply a steel astragal on the opposite side of active door on pairs of fire rated doors.
- I. Apply a steel astragal to meeting style of active leaf of pair of doors or double egress smoke doors.

### **3.2 INSTALLATION OF DOORS APPLICATION OF HARDWARE**

- A. Install doors and hardware as specified in this Section, and to comply with manufacturer's written instructions and referenced quality standard.
  1. Install Fire Rated Doors according to NFPA 80.
  2. Install Smoke and Draft-Control Doors according to NFPA 105.

### **3.3 DOOR PROTECTION**

- A. As door installation is completed, place polyethylene bag or cardboard shipping container over door and tape in place. Do not let tape touch finished surface of door.
- B. Provide protective covering over knobs and handles in addition to covering door.
- C. Maintain covering in good condition until removal is approved by Resident Engineer.

- - - 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. Security Wire Mesh at Windows: 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.

**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 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

- 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**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):
  - A167-99(R-2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

A1008-10 .....Steel Sheet, Cold-Rolled, Carbon, Structural, High Strength  
Low-Alloy

C. American Welding Society (AWS):

D1.3-08 .....Structural Welding Code Sheet Steel

D. National Fire Protection Association (NFPA):

80-10 .....Fire Doors and Windows

E. The National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series .....Metal Finishes Manual

F. Underwriters Laboratories, Inc. (UL):

Fire Resistance Directory

## **PART 2 - PRODUCTS**

### **2.1 FABRICATION, GENERAL**

- A. Fabricate components to be straight, square, flat and in same plane where required.
  - 1. Slightly round exposed edges and without burrs, snags and sharp edges.
  - 2. Exposed welds continuous and ground smooth.
  - 3. Weld in accordance with AWS D1.3.
- B. Number of locks and non-continuous hinges as required to maintain alignment of panel with frame. For fire rated doors, use hinges and locks as required by fire test.
- C. Prepare access panels to receive "Security Lock" deadbolt option similar to "Elmdor" bolt mechanism lock cylinders as specified in Section 08 71 00, DOOR HARDWARE.
- D. 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.
- E. Source Limitations: Obtain each type of Access Door and Frame from a single source form a single manufacturer.

### **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.
  - 1. NFPA 252 or UIL10B for Fire-Rated Access Door Assemblies installed vertically.
  - 2. NFPA 288 for Fire-Rated Access Door Assemblies installed horizontally.
- C. Door Panel: Form of 0.9 mm (0.0359 inch) thick steel or stainless steel sheet (depending on locations identified below), insulated sandwich type construction.

1. Provide Stainless Steel Access Doors / Panels in wet areas or in ceramic tile finished surfaces.
  2. Provide painted Steel Access Doors / Panels in non-wet areas or in nonceramic tile finished surfaces.
- D. Frame: Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed. Provide frame flange at perimeter where installed in concrete masonry or gypsum board openings.
1. Weld exposed joints in flange and grind smooth.
  2. Provide frame flange at perimeter where installed in concrete masonry or gypsum board.
  3. Provide frame material to match door panel material.
- 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 lock cylinders as specified in Section 08 71 00, DOOR HARDWARE.
  2. Provide latch release device operable from inside of door. Mortise case in door.

### **2.3 ACCESS DOORS, FLUSH PANEL:**

- A. Door Panel:
1. Form of 1.9 mm (0.0747 inch) thick steel or 1.5 mm (0.0598 inch) thick stainless steel sheet, depending on locations identified below.
    - a. Provide Stainless Steel Access Doors / Panels in wet areas or in ceramic tile finished surfaces.
    - b. Provide painted Steel Access Doors / Panels in non-wet areas or in nonceramic tile finished surfaces.
  2. Reinforce to maintain flat surface.
- B. Frame:
1. Form of 1.5 mm (0.0598 inch) thick steel or stainless steel sheet to match door / panel material of depth and configuration to suit material and type of construction where installed.
  2. Provide surface mounted units having frame flange at perimeter where installed in concrete, masonry, or gypsum board construction.
  3. Weld exposed joints in flange and grind smooth.
- C. Hinge:
1. Concealed spring hinge to allow panel to open 175 degrees.
  2. Provide removable hinge pin to allow removal of panel from frame.



D. Lock:

1. Prepare access panels to receive lock cylinders as specified in Section 08 71 00, DOOR HARDWARE.

**2.4 FINISH:**

- A. Provide in accordance with NAAMM AMP 500 series on exposed surfaces.
- B. Steel Surfaces: Baked-on prime coat over a protective phosphate coating.
- C. Stainless Steel: No. 4 for exposed surfaces.
- D. Protect mechanical finishes on exposed surfaces from damage by applying a stippable, temporary protective covering before shipping.

**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.
- B. Use fire rated doors in fire rated partitions and ceilings.
- C. Use flush panels in partitions and gypsum board ceilings, except lay-in acoustical panel ceilings.

**3.2 INSTALLATION, GENERAL:**

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. 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.
- C. Set frames so that edge of frames without flanges will finish flush with surrounding finish surfaces.
- D. Set frames with flanges to overlap opening and so that face will be uniformly spaced from the finish surface.
- E. Install lock cylinder.

**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.
- C. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.
- D. Remove protective covering and clean finished surface.

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## **SECTION 08 33 00 COILING DOORS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This section specifies insulated coiling doors of sizes shown, complete as specified.

#### **1.2 RELATED WORK**

- A. Lock cylinders for cylindrical locks: Section 08 71 00, DOOR HARDWARE.
- B. Field painting: Section 09 91 00, PAINTING.
- C. 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, and 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 lists.
- D. Certificates:
  - 1. Attesting doors, anchors and hardware will withstand the horizontal loads specified.
- E. Maintenance Data.

#### **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of

Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **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):
  - A36/A36M-08.....Structural Steel
  - A653/A653M-10.....Steel Sheet, Zinc-Coated (Galvanized) Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- C. National Electrical Manufacturers Association (NEMA):
  - ICS 1-00(R2008).....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 1-10.....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):
  - 70-11 .....National Electrical Code 1999 Edition
- F. National Association of Architectural Metal Manufacturers (NAAMM):
  - AMP 500 Series .....Metal Finishes Manual
- G. Underwriters Laboratories, Inc. (UL):
  - 2010 .....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 958 Pa (20 psf) of door area without damage.
- C. All motor operators shall have manual emergency mechanical operators.
- D. Coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI7.

## **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. 3-1/4" (83mm) maximum center-to-center height.
  - 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).
    - b. For doors from 4530 mm (15 feet 1 inch) to 6300 mm (21 feet wide): 0.90 mm (0.0359 inch).
    - c. For doors wider than 6330 mm (21 feet 1 inch): 1.20 mm (0.0478 inch).
  - 3. Curtain R-Value: 6.0 deg F x h x sq. Ft. / Btu (1.057 x sq. m /W) minimum.
    - a. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.
  - 4. Insulated-slat Interior Facing: Metal.
    - a. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch (0.25mm).
- 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 (not less than 1-1/2 inch by 1-1.2 inch), standard hot-dip galvanized steel members not less than 3 mm (0.125 inch) thick, and finished to match door.
2. Bottom bar designed to receive weather-stripping and safety device, and be securely fastened to bottom of curtain.

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 galvanized 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. Provide guide with replaceable wear strips to prevent metal to metal contact.
6. 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.
3. Chain Lock Keeper: Suitable for padlock.

## **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 MANUAL OPERATORS**

### **A. Hand Chain Operation:**

- 1. Galvanized, endless chain operating over a sprocket and extending to within 900 mm (3 feet) of floor.
- 2. Obtain reduction by use of suitable permanently lubricated gearing connected by roller chain and sprocket drive.
- 3. Calculate gear reduction to reduce pull required on hand chain, not to exceed 1676 Pa (35 psf).

## **2.6 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. Non-galvanized steel: Treat to assure maximum paint adherence, and apply corrosion inhibitive primer.
- 3. Galvanized steel: Apply a phosphate treatment and a corrosion inhibitive primer.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install doors in accordance with approved shop drawings and manufacturer's instructions. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer. Adjust seals to provide tight fit around entire perimeter.

- 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, or if not shown, as directed by the Resident Engineer.
- 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 Doors shall be lubricated, properly adjusted, and demonstrated to operate freely.

### **3.3 INSPECTION**

Upon completion, doors shall be weathertight and doors shall be free from warp, twist, or distortion.

### **3.4 DEMONSTRATION**

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

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**SECTION 08 41 13**  
**ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies exterior and interior aluminum entrance work including storefront construction, hung doors, integral sunscreens, and other components to make a complete assembly.

**1.2 RELATED WORK:**

- A. Sealants: Section 07 92 00, JOINT SEALANTS
- B. Glass and Glazing: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS
- C. Glass and Glazing: Section 08 80 00, GLAZING.
- D. Hardware: Section 08 71 00, DOOR HARDWARE.
- E. Automatic Door Operators: Section 08 71 13, AUTOMATIC DOOR OPERATORS.
- F. Texture and color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: (1/2 full scale) showing construction, 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 insulation.
  - 2. Two samples of anodized aluminum of each color showing finish and maximum shade range.
- E. Manufacturer's Certificates:
  - 1. Stating that aluminum has been given specified thickness of anodizing.
  - 2. Indicating manufacturer's qualifications specified.

#### **1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

- 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.5 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.

#### **1.6 DELIVERY, STORAGE AND HANDLING:**

- A. Deliver aluminum entrance and storefront material to the site in packages or containers; labeled for identification with the manufacturer's name, brand and contents.
- B. Store aluminum entrance upright and storefront material in weather-tight and dry storage facility.
- C. Protect from damage from handling, weather and construction operations before, during and after installation.

#### **1.7 APPLICABLE PUBLICATIONS:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - B209-07 .....Aluminum and Aluminum-Alloy Sheet and Plate
  - B221-08 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
  - E283-04.....Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
  - E331-00(R2009) .....Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

- F468-10.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
- F593-02(R2008).....Stainless Steel Bolts, Hex Cap Screws, and Studs
- C. National Association of Architectural Metal Manufacturers (NAAMM):
  - AMP 500 Series .....Metal Finishes Manual
- D. American Architectural Manufacturer's Association (AAMA):
  - 2604-10 .....High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels
- E. American Welding Society (AWS):
  - D1.2-08 .....Structural Welding Code Aluminum

### 1.8 PERFORMANCE REQUIREMENTS:

- A. Shapes and thickness of framing members shall be sufficient to withstand a design wind load of not less than -22.5 psf to +20.5 psf (zone 4) and not less than -25.8 psf to +20.5 psf (zone 5) 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 x 10<sup>-5</sup> 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 10 pounds per square foot of fixed area.

### 1.9 WARRANTY

- A. Warrant items against malfunctions due to defects in thermal breaks, hardware, materials and workmanship subject to the terms of article "Warranty for Construction" of Section 00 72 00, GENERAL CONDITIONS, except to provide five (5) year warranty period.
- B. Special Warranty: **Manufacturer and Installer** agree to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **Five (5)** years from date of Substantial Completion.
- C. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Warranty Period: **Five (5)** years from date of Substantial Completion.

## **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 6063 temper T6 for guide tracks, sill receptors, sunshade components, and other extruded structural members.
  - 3. For color anodized finish, use aluminum alloy as required to produce specified color.
- 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.
- D. Gaskets:
  - 1. EPDM Rubber.

### **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. Hardware not specified in this section is specified in 08 71 00,m DOOR HARDWARE. 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.
- F. Prepare components to receive anchor devices.
- G. Arrange fasteners and attachments to conceal from view.

### **2.3 PROTECTION OF ALUMINUM:**

- A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by any of the following:
  - 1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint.
  - 2. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
  - 3. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

### **2.4 FRAMES:**

- A. Fabricate doors, frames, mullions, transoms, frames for fixed glass, sunshades, 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.
- E. Exterior Aluminum Frames: Provide thermally broken, 2-1/4 inches by 4-1/2 inches frames with internal reinforcing that are to receive 1-inch insulated glazing.
- F. Interior Aluminum Frames: Provide 2-inch by 4-1/2 inch frames with internal reinforcing that are to receive 1/4-inch glazing.
- G. Sunshades: Provide manufacturer's standard, 20-inch, square projecting outrigger, rectangular fascia, and air foil blades. Provide frame reinforcement as required to support sunshades.
- H. Exterior window frames are to allow glazing from exterior sides of units.

### **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 between stiles and rails. Tie rods are not acceptable in door construction. 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. Anodized Aluminum:
  - 1. Color Finish: Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 7 mils thick. More than 50 percent variation of the maximum shade range approved will not be accepted in a single component or in adjacent components, stiles, and rails on a continuous series. Anticipate 2 color selections. Finish colors of entrance doors to match color of window system frames in which they are located.

## **2.9 ENTRANCE DOOR HARDWARE**

- A. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame hardware schedule for each entrance door to comply with requirements in this Section.
  - 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
  - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
  - 3. Opening-Force Requirements:



- a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
  - b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- B. Opening-Force Requirements:
  - 1. Latches and Exit Devices: Not more than 15 lbf required to release latch.
- C. Pivot Hinges: BHMA A156.4, Grade 1:
  - 1. Offset-Pivot Hinges: Provide top, bottom, and intermediate offset pivots at each door leaf.
- D. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- E. Manual Flush Bolts: BHMA A156.16, Grade 1.
- F. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- G. Cylinders: As specified in Division 08 Section "Door Hardware." and BHMA A156.5, Grade 1.
  - 1. Keying: Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE".
- H. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- I. Operating Trim: BHMA A156.6.
- J. Closers: BHMA A156.4, Grade 1, parallel arm with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to meet field conditions and requirements for opening force.
- K. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- L. Weather Stripping: Manufacturer's standard replaceable components (at exterior doors).
- M. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip (at exterior doors).

N. Silencers: BHMA A156.16, Grade 1.

O. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (at exterior doors). Set in two (2) continuous beads of sealant and mechanically fasten to floor slab.

## **PART 3 - EXECUTION**

### **3.1 Examination**

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive storefront system and sill plate is level in accordance with manufacturer's acceptable tolerances.

1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

### **3.2 INSTALLATION:**

- A. Install per manufacturer's written installation instructions and AAMA storefront and entrance guide specifications manual.
- B. 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.
- C. Anchor aluminum frames to adjoining construction at heads, side jambs and bottom sills and to steel supports, and bracing. Anchor frames with stainless steel or aluminum countersunk flathead, expansion bolts or machine screws, as applicable. Use aluminum clips for internal connections of adjoining frame sections.
- D. 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.
- E. Install hardware specified in this Section and under Section 08 71 00, DOOR HARDWARE.
- F. Install hung door operators specified under Section 08 71 13, AUTOMATIC DOOR OPERATORS.
- G. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.

- H. Set continuous sill receptors and flashing members in full sealant bed as specified in Section 07 92 00, JOINT SEALANTS, to provide weathertight installation.

**3.3 ADJUSTING:**

After installation of entrance and storefront work is completed, adjust and lubricate operating mechanisms to insure proper performance.

**3.4 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. Replace damaged installed products that are not able to be repaired to the satisfaction of the Resident Engineer.

--- E N D ---

**SECTION 08 44 13**  
**GLAZED ALUMINUM CURTAIN WALLS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Section specifies glazed aluminum curtain wall system.
  - 1. Thermally isolated, pressure equalized on interior.
  - 2. Type: Stick system to include following:
    - a. Glass and Glass Spandrel Panels.
    - b. Integral reinforcing.
    - c. Closures, trim, subsills, perimeter sealing, and flashings.
    - d. Column covers.
    - e. Fasteners, anchors, and related reinforcement.

**1.2 RELATED WORK**

- A. Structural steel: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- B. Miscellaneous metal members: Section 05 50 00, METAL FABRICATIONS.
- C. Firestopping between curtain wall and structure: Section 07 84 00, FIRESTOPPING.
- D. Sheet metal flashing and trim: Section 07 60 00, FLASHING AND SHEET METAL.
  - a. Joint sealants: Section 07 92 00, JOINT SEALANTS.
- E. Aluminum and glass hinged entry doors and storefront construction: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- F. Automatic Door Operators: Section 08 71 13, AUTOMATIC DOOR OPERATORS
- G. Glazing: Section 08 80 00, GLAZING.
- H. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Approval is required of products or service of proposed manufacturer, suppliers and installers, and will be based upon submission by Contractor of certification that:
    - a. Manufacturers Qualifications: Manufacturer with fifteen (15) years continuous documented experience in design, fabrication, and installation of glazed aluminum curtain wall systems of type and size required for that project.
    - b. Installer: Manufacturer approved in writing. Continuously installed glazed aluminum curtain walls systems for previous fifteen (15) years.

- c. Manufacturer shall provide technical field representation at project site, as a minimum, at start of project, during middle, towards end of project, and during field testing of field mockup panel.
  - d. Testing Laboratory: Contractor retained. Engage an AAMA accredited commercial testing laboratory to perform tests specified. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to perform testing specified in this section.
  - e. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of glazed aluminum curtain wall system. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, one another, and adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.
    - 1) Do not modify intended aesthetic effects. If modifications are proposed, submit comprehensive explanatory data for review.
  - f. Qualification of Welders:
    - 1) Welding shall be performed by certified welders qualified in accordance with AWS D1.2, using procedures, materials, and equipment of the type required for this work.
- B. Pre-Installation Conference
- 1. Prior to starting installation of glazed curtain wall system schedule conference with Contracting Officer to ensure following:
    - a. Clear understanding of drawings and specifications.
    - b. Onsite inspection and acceptance of structural and pertinent structural details relating to curtain wall system.
    - c. Coordination of work of various trades involved in providing system. Conference shall be attended by Contractor; personnel directly responsible for installation of curtain wall system, flashing and sheet metal work, firestopping system and curtain wall manufacturer and their Technical Field Representatives. Conflicts shall be resolved and confirmed in writing.

## 1.4 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Product Data:
  - 1. Manufacturer's standard details and fabrication methods.
  - 2. Data on finishing, components, and accessories.
  - 3. Instructions: Submit descriptive literature, detail specifications, available performance test data and instructions for installation, and adjustments.
  - 4. Recommendations for maintenance and cleaning of exterior surfaces.
- C. Shop Drawings:
  - 1. Show elevations of glazed curtain wall system at 1:50 (1/4 inch) scale, metal gages, details of construction, methods of anchorage, glazing details, and details of installation.
  - 2. Submit for curtain wall system and accessories: Final approval of drawings shall be deferred pending approval of accessories. Drawings shall indicate in detail all system parts including elevations, full size sections, framing, jointing, panels, types and thickness of metal anchorage details, flashing and coping details, field connections, weep and drainage system, finishes, sealing methods, glazing, glass sizes and details, firestopping insulation materials, and erection details.
  - 3. Operation and Maintenance Manuals
    - a. Submit cleaning and maintenance instructions.
- D. Samples:
  - 1. Submit pairs of samples of each specified color and finish on 300 mm (12-inch) long section by width of each tubular, or extruded shape section or 3-inch by 4-inch wide sections of sheet shapes.
  - 2. Submit corner section of framing members showing fasteners, panels, glazing methods, glazing materials, and weather-stripping. Submit one sample minimum 3 inches by 4 inches. In lieu of submitting separate samples for corner section, intermediate section, and panel, one composite sample incorporating all components and features listed may be submitted.
  - 3. Where normal color variations are anticipated, include 2 or more units in set indicating extreme limits of color variations.
- E. Glass:
  - 1. Specified in Section 08 80 00, GLAZING.
- F. Quality Control Submittals:
  - 1. Design Data:

- a. Submit structural and thermal calculations for complete wall assembly. Structural calculations and design shop drawings shall be signed and sealed by a structural engineer registered in state in which project is to be located.
- 2. Factory Test Reports:
  - a. Test Reports: Provide certified test reports, for each of following listed tests, from a qualified independent testing laboratory showing that glazed aluminum curtain wall system assembly has been tested in accordance with specified test procedures and complies with performance characteristics as indicated by manufacturer's testing procedures. Manufacturer shall submit appropriate testing numbers for specific tests indicated below.
    - 1) Deflection and structural tests.
    - 2) Water penetration tests.
    - 3) Air infiltration tests.
    - 4) Delamination tests.
    - 5) Thermal conductance tests.
    - 6) Submit factory tests required except that where a curtain wall system or component of similar type, size, and design as specified for this project has been previously tested within last year, under conditions specified herein, resulting test reports may be submitted in lieu of listed testing.

G. Manufacturer's Certificates:

- 1. Submit Certificates of Compliance, with specification requirements, for the following:
  - a. Metal extrusions.
  - b. Metal accessories.
  - c. Stating that aluminum has been given specified thickness of anodizing or organic coating finish.
  - d. Indicating manufacturer's and installer's meet qualifications as specified.
  - e. Submit list of equivalent size installations, for both manufacturer and installer, which have had satisfactory and efficient operation.

H. Manufacturer's Field Reports:

- 1. Submit field reports of manufacturer's field representative observations of curtain wall installation indicating observations made during inspection at beginning of project, during middle of installation and at conclusion of project. Indicate results of field testing of mockup field panel, and any directions given Contractor for corrective action.

**1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™  
CERTIFICATION.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Refer to AAMA CW 10 for care and handling of architectural aluminum from shop to site.
- B. Prior to packaging for shipment from factory, mark wall components to correspond with shop and erection drawings and their placement location and erection.
- C. Prior to shipment from factory, place knocked-down lineal members in cardboard containers and cover finished surfaces of members with protective covering of adhesive paper, waterproof tape, or strippable plastic. Do not cover metal surfaces that will be in contact with sealants after installation.
- D. Inspect materials delivered to site for damage; unload and store with ventilation, free from heavy dust, not subject to combustion products or sources of water, and shall permit easy access for inspection and handling. Sealing and caulking compounds, including handling, shall be in accordance with requirements of Section 07 92 00 JOINT SEALANTS.

**1.7 PROJECT CONDITIONS**

Field Measurements: Where glazed aluminum curtain wall systems are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying Work.

**1.8 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referred to in text by basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
  - MCWM-1-89 .....Metal Curtain Wall Manual
  - CW 10-04.....Care and Handling of Architectural Aluminum from Shop to Site



- CW 11-85.....Design Windloads for Buildings and Boundary Layer Wind  
Tunnel Testing
- CW 13-85.....Structural Sealant Glazing Systems (A Design Guide)
- CWG 1-89.....Installation of Aluminum Curtain Walls
- TIR A1-04.....Sound Control for Fenestration Products
- TIR A8-08.....Structural Performance of Composite Thermal Barrier Framing  
Systems
- TIR A9-91.....Metal Curtain Wall Fasteners
- TIR A11-04.....Maximum Allowable Deflection of Framing Systems for  
Building Cladding Components of Design Wind Loads
- 101/I.S.2/A440-08 .....Windows, Doors and Unit Skylights
- 501-05 .....Methods of Test for Exterior Walls
- 503-08 .....Field Testing of Metal Storefronts, Curtain walls and Sloped  
Glazing Systems
- 2605-98 .....High Performance Organic Coatings on Architectural Extrusions  
and Panels
- 1503-09 .....Thermal Transmission and Condensation Resistance of  
Windows, Doors and Glazed Wall Sections
- C. American National Standards Institute (ANSI):
- Z97.1-09.....Glazing Materials Used in Buildings, Safety Performance  
Specifications and Methods of Test
- D. American Society of Civil Engineers (ASCE):
- ASCE 7-10.....Minimum Design Loads for Buildings and Other Structures
- E. American Society for Testing and Materials (ASTM):
- A36/A36M-08.....Structural Steel
- A123-09 .....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- A193-10 .....Alloy-Steel and Stainless Steel Bolting Materials for High  
Temperature Service
- A307-10 .....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
- B209-10 .....Aluminum and Aluminum Alloy Sheet and Plate
- B211-03 .....Aluminum and Aluminum Alloy Bar, Rod, Wire
- B221/B221M-08 .....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire,  
Shapes and Tubes

- B316/B316M-10 ..... Aluminum and Aluminum Alloy Rivet and Cold-Heading, Wire,  
and Rods
- C920-11 ..... Elastomeric Joint Sealants
- C794-10 ..... Standard Test Method for Adhesion-In-Peel of Elastomeric Joint  
Sealants.
- C1363-05 ..... Thermal Performance of Building Materials and Envelope  
Assemblies by Means of a Hot Box Apparatus
- D1037-06 ..... Evaluating the Properties of Wood-Base Fibers and Particle  
Panel Materials
- E90-09 ..... Laboratory Measurement of Airborne Sound Transmission Loss  
of Building Partitions and Elements
- E283-04 ..... Determining Rate of Air Leakage Through Exterior Windows,  
Curtain Walls, and Doors under Specified Pressure Difference  
Across this Specification
- E330-02(R2010) ..... Structural Performance of Exterior Windows, Curtain Walls, and  
Doors by Uniform Static Air Pressure Difference
- E331-00(R2009) ..... Water Penetration of Exterior Windows, Curtain Walls, and  
Doors By Uniform Static Air Pressure Difference
- E413-10 ..... Classification for Rating Sound Insulation
- E783-02(R2010) ..... Test Method for Field Measurement of Air Leakage Through  
Installed Exterior Windows and Doors.
- E1105-00(R2008) ..... Field Determination of Water Penetration of Installed Exterior  
Windows, Curtain Walls, and Doors By Uniform or Cyclic Static  
Air Pressure Differences
- F. American Welding Society, Inc. (AWS):
  - D1.2-08 ..... Structural Welding Code-Aluminum
- G. Consumer Product Safety Commission (CPSC):
  - 16 CFR 1201 ..... Architectural Glazing Standards and Related Material
- H. Federal Specifications (FS):
  - TT-P-645B-90 ..... Primer, Paint, Zinc-Molybdate, Alkyd Type
- I. Glass Association of North America (GANA):
  - 2010 Edition ..... GANA Glazing Manual
  - 2008 Edition ..... GANA Sealant Manual
  - 2009 Edition ..... GANA Laminated Glazing Reference Manual

2008 Edition.....Tempered Glass Engineering Standard Manual

J. Military Specifications (MIL):

MIL-C-18480.....(Rev. B) Coating Compound, Bituminous Solvent, Coal Tar  
Base

K. National Association of Architectural Metal Manufacturers (NAAMM):

500 Series (2006) .....Metal Finishes Manual.

L. Steel Structures Painting Council (SSPC)

Paint 25-97 (2004) .....Red Iron Oxide Raw Linseed Oil and Alkyd Primer (Without  
Lead and Chromate Pigments

## **1.9 WARRANTY**

- A. Submit manufacturer's written warranty for materials, installation and weathertightness, and subject to terms of Article "Warranty of Construction" or Section 00 72 00, GENERAL CONDITIONS, except that warranty period shall be extended to five (5) years from date of final acceptance of project by Government.

## **PART 2 - PRODUCTS**

### **2.1 SYSTEM DESCRIPTION**

A. Design Requirements:

1. Curtain Wall System: Tubular aluminum sections with thermal break condition, self supporting framing, factory prefinished, vision glass, and spandrel infill; related flashings, anchorage and attachment devices.
2. System Assembly: Shop unitized assembly.
3. No curtain wall framing member shall deflect, in a direction normal to plane of wall, more than  $1/175$  of its clear span (for up to 13'-6" lengths) or  $L/240 + 1/4$ -inch (for 13'-6" lengths and above), when designed in accordance with requirements of TIR A11 and tested in accordance with ASTM E330, except that when a gypsum wallboard surface will be affected, deflection shall not exceed  $1/360$  of span. No framing member shall have a permanent deformation in excess of 0.2 percent of its clear span when tested in accordance with ASTM E330 for a minimum test period of 10 seconds at 1.5 times design wind pressures indicated as part of structural drawing wind load requirements. No glass breakage, damage to fasteners, hardware or accessories shall be permitted due to deformation stated above:
  - a. Provide system complete with framing, mullions, trim, fasteners, anchors, accessories, concealed auxiliary members, and attachment devices for securing wall to structure as specified or indicated. Unless noted otherwise, comply with MCWM-1.

- b. Curtain wall system components and integral door and/or window units shall be furnished by one manufacturer or fabricator; however, all components need not be products of same manufacturer.
  - c. Fully coordinate system accessories directly incorporated, and adjacent to contiguous related work and insure materials compatibility, deflection limitations, thermal movements, and clearances and tolerances as indicated or specified.
  - d. Provide system with adequate allowances for expansion and contraction of components and fastenings to prevent buckling damage, joint seal failure, glass breakage, undue stress on fastenings or other detrimental effects. For design purposes, base provisions for thermal movement on assumed ambient temperature range of from -18 degrees C to 49 degrees C (0 degrees F to 120 degrees F).
  - e. Provide wall system to accommodate tolerances in building frame and other contiguous work as indicated or specified.
- B. Manufacturer's Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of curtain walls that are similar to those indicated for this Project in material, design, and extent.
- C. Performance Requirements:
- 1. System shall meet or exceed all performance requirements specified.
  - 2. Curtain wall components shall have been tested in accordance with requirements below and shall meet performance requirements specified:
  - 3. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with ASCE 7-Minimum Design Loads for Buildings and Other Structures. to a design pressure of not less than -22.5 psf to +20.5 psf (zone 4) and not less than -25.8 psf to +20.5 psf (zone 5) as measured in accordance with ASTM E330.
  - 4. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with all applicable Building and Life Safety Codes.
  - 5. Water Penetration:
    - a. No water penetration shall occur when wall is tested in accordance with ASTM E331 at a differential static test pressure of 20 percent of inward acting design wind pressure as indicated on structural drawings, but not less than 15 psf.

- b. Make provision in wall construction for adequate drainage to outside of water leakage or condensation that occurs within outer face of wall. Leave drainage and weep openings in members and wall open during test.
- 6. Air Infiltration: Test glazed aluminum curtain wall system according to AAMA 503, which requires testing according to ASTM E283
  - a. Static-Air-Differential: 6.24 lbf/sq. ft. minimum.
  - b. Air Leakage: 0.06 cfm/sq ft of surface maximum.
- 7. Deflections Test: ASTM E330, Procedure B:
  - a. No member shall deflect in a direction parallel to plane of wall, when carrying its full design load, more than an amount which will reduce edge cover or glass bite below 75 percent of design dimension. No member after deflection under full design load, shall have a clearance between itself and top of panel, glass, sash, or other part immediately below it less than 3 mm (1/8 inch); clearance between member and an operable window or door shall be minimum 1.5 mm (1/16 inch).
- 8. Delamination Test:
  - a. Adhesively bonded metal-faced panels shall show no evidence of delamination, warpage or other deterioration or damage when subjected to the six "Accelerated Aging Cycles" specified in ASTM D1037.
- 9. Thermal Conductance Tests: AAMA 1503.
  - a. The thermal transmittance of opaque panels shall not exceed a U-value, Btu/hr/sq ft/degree F, as required and indicated on contract drawings for exterior wall system, when tested in accordance with AAMA 1503. Average calculated thermal transmittance of complete wall assembly including panels, windows, and all other components shall not exceed a U-value of 0.53 BRU/hr/ft<sup>2</sup>.
- 10. Window Tests:
  - a. Windows shall meet same requirements for deflection and structural adequacy as specified for framing members when tested in accordance with ASTM E330 except permanent deformation shall not exceed 0.4 percent; there shall be no glass breakage, and no permanent damage to fasteners, anchors, hardware, or operating devices. Windows shall have no water penetration when tested in accordance with requirements of ASTM E331.
- 11. Sound Attenuation Through Wall System (Exterior to Interior):
  - a. STC 31 or OITC of 26, measured in accordance with ASTM E413.

## 2.2 MATERIALS

- A. Extruded Aluminum Framing Members: ASTM B221; 6063-T6 extruded aluminum for non-structural components or 6063-T6 extruded aluminum for structural members; temper and alloy as recommended by manufacturer.
- B. Sheet Aluminum: ASTM B209; 6065-T5 temper and alloy as recommended by manufacturer.
  - 1. Formed flashing and closures: Minimum 1.58 mm (0.062 inch) thick aluminum, in finish as selected.
  - 2. Extruded sill members: Minimum 1.58 mm (0.062 inch) thick aluminum, in finish as selected.
- C. Steel Sections: ASTM A36.
- D. Primer: TS TT-P-645; red, for shop application and field touch-up.
- E. Fasteners:
  - 1. For Exterior Cap Retainers: ASTM A193 B8 300 series, stainless steel screws.
  - 2. For Framework Connections: ASTM B211M 2024-T4 aluminum, ASTM A193 B8 300 series, stainless steel, and ASTM B316 aluminum rivets, as required by connection.
  - 3. For Anchoring Glazed Aluminum Curtain Wall to Support Structure: ASTM A307 zinc plated steel fasteners.
- F. Shims: Metal or plastic.
- G. Joint Sealants and Accessories:
  - 1. In accordance with requirements specified in Section 07 92 00, JOINT SEALANTS.
  - 2. Structural Flush Glazed Joints: High performance silicone sealant applied in accordance with manufacturer's recommendations.
  - 3. Non-structural Flush Glazed Joints and Weather Seal Joints: Silicone sealants applied in accordance with manufacturer's recommendations.
  - 4. Structural silicone sealant performance requirements: ASTM C920.
    - a. Hardness: Type A, 30 durometer.
    - b. Ultimate Tensile Strength: 1172 kPa (170 psi).
    - c. Tensile at 150% Elongation: 55 kPa (80 psi).
    - d. Joint Movement Capability after 14 Day Cure: +/- 50%.
    - e. Peel Strength aluminum, after 21 Day Cure: 599 g/mm (34 pounds per inch).
  - 5. Structural silicone shall not be used to support dead weight of vertical glass or panels.
  - 6. Comply with recommendations of sealant manufacturer for specific sealant selections.
  - 7. Provide only sealants that have been tested per ASTM C794 to exhibit adequate adhesion to samples of glass and metal equivalent to those required for project.

8. Exposed metal to metal joints: Silicone sealant selected from manufacturer's standard colors.
- H. Glazing Materials:
1. As specified under Section 08 80 00, GLAZING.
  2. Glazing Gaskets:
    - a. Exterior: Continuous EPDM gaskets at each glass and spandrel panel.
    - b. Interior: Continuous, closed cell PVC foam sealant tape, sealed at corners.
  3. Glass Sizes and Clearances:
    - a. Accommodate up to 25 mm (1 inch) glazing.
    - b. Sizes indicated are nominal. Verify actual sizes required by measuring frames.  
Coordinate dimensions for glass and glass holding members to meet applicable minimum clearances as recommended by glass manufacturer. Do not nip glass to remove flares or to reduce oversized dimensions. All cutting shall occur in factory.
  4. Glass Setting Materials:
    - a. Provide head bead and drive wedge required for glass installation to suit curtain wall system in accordance with manufacture's recommendations.
    - b. If used in psychiatric facilities, the glass shall be retained in the framing system in such a manner that it can withstand lateral forces in excess of force required to break the glass.  
Plastic clips for holding glass are not permitted.
- I. Column Covers Exterior and Interior Surfaces: prefinished aluminum of the same thickness and color or the adjacent curtain wall mullion sections, ensuring flat surface.
- J. Firestopping: Refer to Section 07 84 00, FIRESTOPPING for requirements.
- K. Pressure Caps:
1. Manufacturer's standard aluminum components that mechanically retain glazing.
  2. Include snap-on aluminum trim that conceals fasteners.
- L. Brackets and Reinforcements:
1. Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

## **2.3 FABRICATION**

- A. Curtain wall components shall be of materials and thickness indicated or specified. Details indicated are representative of required design and profiles. Maintain sightlines indicated on drawings. Unless specifically indicated or specified otherwise, methods of fabrication and assembly shall be at discretion of curtain wall manufacturer. Perform fitting and assembling of components in shop to maximum extent practicable. Anchorage devices shall permit adjustment in three directions. There shall be no exposed fasteners.

- B. Joints: Joints exceeding +1.5 mm (+1/16") shall be mechanically fastened.
- C. Ventilation and Drainage: Direct water leakage to exterior by means of concealed drainage system and weeps. Flashings and other materials used internally shall be nonstaining, noncorrosive, and nonbleeding.
- D. Protection and Treatment of Metals:
  - 1. Remove from metal surfaces lubricants used in fabrication and clean off other extraneous material before leaving shop.
  - 2. Provide protection against galvanic action wherever dissimilar metals are in contact, except in case of aluminum in permanent contact with galvanized steel, zinc, stainless steel, or relatively small areas of white bronze. Paint contact surfaces with one coat bituminous paint conforming to MIL-C-18480 or apply appropriate caulking material or nonabsorptive, noncorrosive, and nonstaining tape or gasket between contact surfaces.
- E. Metal sills and Closures: Fabricate accessories, spandrel panels, trim closures of sizes and shapes indicated from similar materials and finish as specified for wall system.
- F. Concealed Interior Mullion Reinforcing: ASTM A36 steel shapes as required for strength and mullion size limitations, hot dip galvanized after fabrication in accordance with ASTM A123.

## **2.4 PROTECTION**

- A. Provide protection for aluminum against galvanic action, wherever dissimilar materials are in contact, by painting contact surfaces of dissimilar material with a heavy coat of bituminous paint (complete coverage), or by separating contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on one side.

## **2.5 METAL FINISHES**

- A. In accordance with NAAMM AMP500 series.
- B. Anodized Aluminum:
  - 1. AA-C22A44 Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class 1 Architectural, 0.7-mil thick finish. Dyes will not be accepted.
    - a. Medium bronze.
- C. Shop and Touch-Up Primer for Steel Components: SSPC Paint 25 red oxide.
- D. Touch-Up Primer for galvanized Steel Surfaces: SSPC Paint 20 zinc rich.
- E. Concealed Steel Items: Galvanized in accordance with ASTM A123 to 2.0 oz/sq ft. Primed with iron oxide paint.
- F. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.



## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Prior to installation of glazed curtain wall system, arrange for representative(s) of manufacturer to examine structure and substrate to determine that they are properly prepared, and ready to receive glazed curtain wall work included herein.
- B. Verifying Conditions and Adjacent Surfaces: After establishment of lines and grades and prior to system installation examine supporting structural elements. Verify governing dimensions, including floor elevations, floor to floor heights, minimum clearances between curtain wall and structural frames, and other permissible dimensional tolerances in building frame.

### **3.2 PREPARATION**

- A. Take field dimensions and examine condition of substrates, supports, and other conditions under which work of this section is to be performed to verify that work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Contact between aluminum and dissimilar metals shall receive a protective coating of asphaltic paint for prevention of electrolytic action and corrosion.

### **3.3 INSTALLATION**

- A. Installation and erection of glazed curtain wall system and all components shall be in accordance with written directions of curtain wall manufacturer. Match profiles, sizes, and spacing indicated on approved shop drawings. Do not install damaged components.
- B. Bench Marks and Reference Points: Establish and permanently mark bench marks for elevations and building line offsets for alignment at convenient points on each floor level. Should any error or discrepancy be discovered in location of marks, stop erection work in that area until discrepancies have been corrected.
- C. Ensure that drainage system operates properly in accord with AAMA 501 procedures.
- D. Do not proceed with structural silicone work when metal temperature is below 0 degrees C (32 degrees F).
- E. Isolate between aluminum and dissimilar metals with protective coating or plastic strip to prevent electrolytic corrosion.
- F. Install glazed aluminum curtain wall system so as to maintain a virtually flat face cap, with no visible bowing.
- G. Install entire system so that fasteners are not visible.
- H. Tolerances:

1. Maximum variation from plane or location shown on approved shop drawings: 3 mm per 3600 mm (1/8 inch per 12 feet) of length up to not more than 13 mm (1/2 inch) in any total length.
2. Maximum offset from true alignment between two identical members abutting end to end in line: 0.8 mm (1/32 inch).
3. Sealant Space Between Curtain Wall Mullion and Adjacent Construction: Maximum of 19 mm (3/4 inch) and minimum of 6 mm (1/4 inch).

J. Joint Sealants:

1. Joint Sealants: Shall be in accordance with requirements of Section 07 92 00, JOINT SEALANTS.
2. Surfaces to be primed and sealed shall be clean, dry to touch, free from frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter. Enclose joints on three sides. Clean out grooves to proper depth. Joint dimensions shall conform to approved detail drawings with a tolerance of plus 3 mm (1/8 inch). Do not apply compound unless ambient temperature is between 5 and 35 degrees C (40 and 90 degrees F). Clean out loose particles and mortar just before sealing. Remove protective coatings or coverings from surfaces in contact with sealants before applying sealants or tapes. Solvents used to remove coatings shall be of type that leave no residue on metals.
3. Match approved sample. Force compound into grooves with sufficient pressure to fill grooves solidly. Sealing compound shall be uniformly smooth and free of wrinkles and, unless indicated otherwise, shall be tooled and left sufficiently convex to result in a flush joint when dry. Do not trim edges of sealing material after joints are tooled. Mix only amount of multi-component sealant which can be installed within four hours, but at no time shall this amount exceed 19 liters (5 gallons).
4. Apply primer to masonry, concrete, wood, and other surfaces as recommended by sealant manufacturer. Do not apply primer to surfaces which will be exposed after caulking is completed.
5. Tightly pack backing in bottom of joints which are over 13 mm (1/2 inch) in depth with specified backing material to depth indicated or specified. Roll backing material of hose or rod stock into joints to prevent lengthwise stretching.
6. Install bond preventive material at back or bottom of joint cavities in which no backstop material is required, covering full width and length of joint cavities.
7. Remove compound smears from surfaces of materials adjacent to sealed joints as work progresses. Use masking tape on each side of joint where texture of adjacent material will be

difficult to clean. Remove masking tape immediately after filling joint. Scrape off fresh compound from adjacent surfaces immediately and rub clean with approved solvent. Upon completion of caulking and sealing, remove remaining smears, stains, and other soiling, and leave work in clean neat condition.

J. Glass:

1. Refer to Section 08 80 00, GLAZING, and drawing for glass types. Install in accordance with manufacturer's recommendations as modified herein.
2. Before installing glass, inspect sash and frames to receive glass for defects such as dimensional variations, glass clearances, open joints, or other conditions that will prevent satisfactory glass installation. Do not proceed with installation until defects have been corrected.
3. Clean sealing surfaces at perimeter of glass and sealing surfaces of rebates and stop beads before applying glazing compound, sealing compound, glazing tape, or gaskets. Use only approved solvents and cleaning agents recommended by compound or gasket manufacturer. All sashes shall be designed for outside glazing. Provide continuous snap in glazing beads to suit glass as specified.
4. Insulating and tempered glass, and glass of other types that exceed 100 united inches in size: Provide void space at head and jamb to allow glass to expand or move without exuding sealant. Perimeter frames and ventilator sections shall have glazing rebates providing an unobstructed glazing surface 19 mm (3/4 inch) in height. Glazing rebate surfaces must be sloped to shed water.
5. Provide adequate means to weep incidental water and condensation away from sealed edges of insulated glass units and out of wall system. Weeping of lock-strip gaskets should be in accordance with recommendation of glass manufacturer.

K. Metal Copings:

1. Refer to Section 07 60 00, FLASHING AND SHEET METAL for requirements of metal copings when they are not a part of glazed curtain wall system work.
2. Coordinate curtain wall installation with metal coping detail on contract drawings. Provide watertight seal to meet criteria set forth in this section regarding air and water penetration.

### **3.4 ADJUSTING**

- A. Adjust doors to provide a tight fit at contact points and operate easily.
- B. Adjust weather-stripping to make even contact with surfaces.
- C. Adjust operating hardware and moving parts.

### **3.5 CLEANING**

- A. Install curtain wall frame and associated metal to avoid soiling or smudging finish.
- B. Clean metal surfaces promptly after installation, exercising care to avoid damage to coatings.
- C. Remove excess glazing and sealant compounds, dirt, and other substances.
- D. Follow recommendations of manufacturer in selection of cleaning agents. Do not use cleaning agents containing ammonia or other compounds that might damage finished metal surfaces.
- E. Replace cracked, broken, and defective glass with new glass at no additional cost to Government.  
Just prior to final acceptance of curtain wall system clean glass surfaces on both sides, remove labels, paint spots, compounds, and other defacements, and clean metal fixed panels. Remove and replace components that cannot be cleaned successfully.

### **3.6 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage an AAMA accredited commercial qualified independent testing and inspecting agency to perform field quality-control tests specified, and to prepare test reports: Submit information regarding testing laboratory's facilities and qualifications of technical personnel to Contracting Officer for approval.
- B. Conduct field check test for water leakage on designated wall areas after erection to comply with AAMA 501.2. Conduct test on two wall areas, two bays wide by two stories high where directed. Conduct test and take necessary remedial action as directed by Contracting Officer.
- C. Test Specimen:
  - 1. Test specimen shall include curtain wall assembly and construction. Test chamber shall be affixed to exterior side of test specimen and test shall be conducted using positive static air pressure.
  - 2. Test specimens shall be selected by Contracting Officer after curtain wall system has been installed in accordance with contract drawings and specification.
- D. Sealant Adhesion Tests: Test installed sealant, in presence of sealant manufacturer's field representative, in a minimum of two areas and as follows:
  - 1. Test structural silicone sealant according to field adhesion test method described in AAMA CW 13, "Structural Sealant Glazing Systems (A Design Guide)."
  - 2. Test weatherseal sealant as recommended in writing by sealant manufacturer.
- E. Air Infiltration: Test glazed aluminum curtain wall system according to AAMA 503, which requires testing according to ASTM E783.
  - 1. Field air leakage testing is not required for continuous curtain wall systems.
  - 2. Static-Air-Pressure Differential: 75 Pa (1.57 lbf/sq. ft.) minimum.
  - 3. Air Leakage: 0.03 L/s per sq. m (0.06 cfm/sq. ft.) of surface maximum.

F. Water Penetration: Test glazed aluminum curtain wall system for compliance with requirements according to AAMA 503, which requires testing according to ASTM E1105.

1. Uniform Static-Air-Pressure Difference: 20 percent of positive design wind load, but not less than 479 Pa (10 psf). No uncontrolled water shall be present.

G. Retesting:

1. Should system fail field test, system may be modified or repaired, and retested.
2. Should system fail second field test, system may be additionally modified or repaired, and retested.
3. All modifications and repairs made to tested areas shall be recorded, and same modifications and repairs made to all system and adjacent construction on project.
4. Should second test fail, Contracting Officer may require testing of additional areas of the curtain wall.

H. Rejection:

1. Failure of any of specimens to meet test requirements of third test shall be cause for rejection of wall system and adjacent construction on project.

### **3.7 DEMONSTRATION, TESTING, AND ACCEPTANCE**

- A. Instruct Owner's personnel in proper operation and maintenance of horizontal sliding entrance door equipment. Train personnel in procedures to follow in event of operational failures or malfunctions.
- B. Acceptance: At completion of project, and as a condition of acceptance, horizontal sliding entrance door equipment and systems shall be operated for a period of fifteen (15) consecutive calendar days without breakdown.

### **3.8 PROTECTION**

- A. After installation, protect windows, and other exposed surfaces from disfiguration, contamination, contact with harmful materials, and from other construction hazards that will interfere with their operation, or damage their appearance or finish. Protection methods shall be in accordance with recommendations of product manufacturers or of respective trade association. Remove paper or tape factory applied protection immediately after installation. Clean surfaces of mortar, plaster, paint, smears of sealants, and other foreign matter to present neat appearance and prevent fouling of operation. In addition, wash with a stiff fiber brush, soap and water, and thoroughly rinse. Where surfaces become stained or discolored, clean or restore finish in accordance with recommendations of product manufacturer or respective trade association.
- B. Replace damaged installed products that are not able to be repaired to the satisfaction of the Resident Engineer.

--- END ---

**SECTION 08 71 00  
DOOR HARDWARE**

**PART 1 GENERAL**

**1.1 CONDITIONS**

- A. The general conditions, supplementary general conditions, and all contract documents are a part of this division of the specifications and all provisions contained herein.  
Submission of proposal implies that the bidder is fully familiar with all requirements of said documents.

**1.2 SCOPE**

- A. The finish hardware supplier shall furnish all necessary items for complete installation and operation of doors of this project, as specified in paragraph 3.7, hardware sets, or as necessary to complete this building excepting the items specifically excluded.

**1.3 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 31 13, ACCESS DOORS AND FRAMES, Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS, Section 08 33 13, COILING COUNTER DOORS, Section 08 71 13, AUTOMATIC DOOR OPERATORS, and Section 13 49 00, RADIATION PROTECTION.
- C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Painting: Section 09 91 00, PAINTING.
- E. Card Readers: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEMS.
- F. Electrical: Division 26, ELECTRICAL.
- G. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

**1.4 WORK NOT INCLUDED**

- A. Window hardware
- B. Folding partition hardware
- C. Toilet partition hardware
- D. Overhead door hardware (except cylinders or padlocks)
- E. Aluminum door hardware (except cylinders)
- F. Cabinet and millwork hardware

## **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.6 QUALITY ASSURANCE**

- A. The hardware supplier shall submit six (6) typewritten hardware schedules to the Resident Engineer through the general contractor for approval. Each schedule shall contain the door index listing or opening on the project and the hardware for said opening. Each item of hardware listed is to be clearly identified by manufacturer, manufacturer's number and finish.
- B. The Resident Engineer retains the authority to approve or reject any schedule based upon his knowledge of the suppliers experience and capabilities, the general quality of the products submitted and compliance with the specifications.
- C. If requested, the supplier shall provide working samples of any items he proposes to substitute. Samples will be returned to the jobsite for installation.
- D. The hardware supplier shall forward template information to all related trades within ten (10) days after receipt of approved hardware schedules. Template submission shall be made in accordance with the latest standards as published by the door and hardware institute.
- E. The supplier shall forward wiring diagrams to all affected trades within ten (10) days after receipt of approved hardware schedule.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- A. Deliver items of hardware to job site in their original containers, complete with necessary appurtenances including screws, keys, and instructions. Tag one of each different item of hardware and deliver to Resident Engineer for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in Resident Engineer's office until all other similar items have been



installed in project, at which time the Resident Engineer will deliver items on file to Contractor for installation in predetermined locations on the project.

- B. All items of hardware shall be clearly marked with door number, key symbol, and heading number to correspond with the approved hardware schedule.
- C. The general contractor will be responsible for providing a dry, clean, locked room of adequate size for storage of hardware.

#### **1.8 GUARANTEE**

- A. The hardware supplier shall guarantee that all materials furnished under this division will be free from defects and blemishes for a period of one (1) year from date of acceptance. The supplier shall repair or replace at his expense, including labor, when instructed to do so by the architect and/or owner any item of finish hardware which may prove to be defective within said period.

#### **1.9 MAINTENANCE MANUALS**

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

#### **1.10 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.

## **1.11 PREINSTALLATION MEETING**

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

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Product numbers listed in the following specifications are taken from the catalogs of manufacturers listed as follows:
- (H) HAGER HINGE COMPANY
  - (S) STANLEY HARDWARE
  - (B) BEST ACCESS SYSTEMS
  - (A) ARCHITECTURAL BUILDERS HARDWARE
  - (S) SCHLAGE
- B. Products of the following manufacturers will be considered acceptable provided they are of equivalent weight, function and design.

1. BUTTS:  
IVES STANLEY
2. LOCKS:  
BEST AS SPECIFIED NO SUBSTITUTE
3. PANIC DEVICES:  
VON DUPRIN SARGENT
4. DOOR CLOSERS:  
LCN CORBIN RUSSWIN
5. DOOR TRIM:  
IVES ROCKWOOD
6. DOOR STOPS AND MISCELLANEOUS HOLDERS:  
IVES ROCKWOOD
7. THRESHOLDS AND WEATHERSTRIPPING:  
NATIONAL GUARD PRODUCTS ZERO

## **2.2 FINISH**

- A. Exposed surfaces of hardware shall have ANSI A156.18 finishes.
- B. The finish in general shall be satin chrome (BHMA 626 OR BHMA 652).
- C. Satin stainless steel (BHMA 630) may be provided at the supplier's option.
- D. Door closers shall be painted aluminum (BHMA 689).
- E. Kick plates shall be stainless steel (BHMA 630).
- F. Thresholds and weather-strips shall be mill finish aluminum except at storefront and curtain wall window system which shall match the window system color.

## **2.3 FASTENERS**

- A. Where sex nut bolts are specified in paragraph 3.05, furnish sex bolts sized to the thickness of the door.
- B. Wood screws are to be threaded to the head.
- C. Material of fasteners shall be ferrous or non-ferrous matching the product being applied.
- D. Length of fasteners shall be sufficient to afford adequate thread engagement.

## **2.4 KEYING**

- A. All locks are to be subject to the existing best key system.
- B. Provide locks with temporary construction cores.
- C. Furnish ten (10) construction keys and four (4) construction control keys.
- D. A representative of the best lock company shall consult with the Resident Engineer to determine permanent keying.

- E. Permanent cores and keys are to be delivered to the Resident Engineer.
- F. Installation of the permanent cores is to be by the general contractor. Construction cores are to be returned to the Resident Engineer.

## **2.5 KEY CONTROL SYSTEM**

- A. Provide a complete key control system including envelopes, labels, and tags with self locking key clips, receipt forms, 3-way visible card index, temporary markers and standard metal cabinet. The size of the system is to be 200% of the number of locks required for the project. Coordinate actual key control cabinet size with the Resident Engineer.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION**

- A. Conditions of opening size shall be verified by the general contractor as to door frames being plumb and of correct tolerances to receive door and hardware.

### **3.2 INSTALLATION**

- A. The installer shall be competent and have knowledge of hardware.
- B. Mounting heights for all hardware shall be recommended by the Door and Hardware Institute.
- C. For existing buildings locate hardware on doors at heights to match existing hardware. The Contractor shall visit the site, verify location of existing hardware and submit locations to VA Resident Engineer for approval.
- D. 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:
- E. 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.

- F. 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.
- 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 ADJUSTING**

- A. The general contractor shall be responsible for final adjustments on all items of finish hardware. He shall replace or repair any items of hardware until owner accepts the project as complete.
- B. Door closers are to be adjusted to meet the opening force requirements of federal, state or local codes or requirements. In instances where pressure, drafts or other factors prevent the proper operation and compliance of the closers, the contractor shall consult with the architect for guidance.
- C. The contractor shall adjust the closers after all HVAC systems are operational and adjusted. The contractor shall be prepared to make a final adjustment to the door closers within six (6) months after occupancy.

### **3.4 FINAL INSPECTION**

- A. Installer to provide letter to VA Resident/Project Engineer that upon completion, installer has visited the Project and has accomplished the following:
  - 1. Re-adjust hardware.
  - 2. Evaluate maintenance procedures and recommend changes or additions, and instruct VA personnel.
  - 3. Identify items that have deteriorated or failed.
  - 4. Submit written report identifying problems.

### 3.5 DEMONSTRATION

- A. Demonstrate efficacy of mechanical hardware and electrical, and electronic hardware systems, including adjustment and maintenance procedures, to satisfaction of Resident/Project Engineer and VA Locksmith.

### 3.6 PROTECTION

- A. The general contractor is responsible for protection of all items of hardware until owner accepts the project as complete.

### 3.7 HARDWARE SETS

- A. The following is a general listing of the minimum hardware requirements. Any item of hardware normally required by good practice, or as to meet state or local codes, shall be furnished even though it may not be specifically mentioned.

#### HW-1

|     |       |                |                      |
|-----|-------|----------------|----------------------|
| (H) | 3 EA  | HINGES         | BB1191 4 ½ X 4 ½ NRP |
| (V) | 1 EA  | EXIT DEVICE    | RX 99L X E996L       |
| (B) | 1 EA  | CYLINDER       | 1E72                 |
| (S) | 1 EA  | CLOSER         | 4551 X HCS X SNB     |
| (H) | 1 EA  | KICK PLATE     | 190S 10 X DW LESS 2" |
| (H) | 1 EA  | STOP           | 267F                 |
| (V) | 1 EA  | POWER TRANSFER | EPT-10               |
| (V) | 1 EA  | POWER SUPPLY   | PS902                |
| (H) | 1 SET | GASKET         | 891S X SIZE REQUIRED |
| (H) | 1 EA  | THRESHOLD      | 427S X LR            |
| (H) | 1 EA  | DOOR BOTTOM    | 750S X LR            |
| (H) | 1 EA  | DRIP STRIP     | 810S X DW PLUS 4"    |

Card Reader/Keypad by Access Control Contractor.

#### HW-2

|     |    |           |  |
|-----|----|-----------|--|
| (B) | EA | CYLINDERS | OF TYPE AND QUANTITY<br>REQUIRED TO OPERATE LOCKING<br>MECHANISM |
|-----|----|-----------|--|

#### HW-3

|     |       |                   |                              |
|-----|-------|-------------------|------------------------------|
| (H) | 2 EA  | CONTINUOUS HINGES | 780-224HD EPT                |
| (V) | 2 EA  | EXIT DEVICE       | CX 9927EO-F LBR RGO          |
| (V) | 2 EA  | POWER TRANSFER    | EPT-10                       |
| (V) | 2 EA  | POWER SUPPLY      | PS914                        |
| (S) | 2 EA  | CLOSER            | 4551 X SNB                   |
| (H) | 2 EA  | KICK PLATE        | 190S 10 X DW LESS 2"         |
| (H) | 1 SET | GASKET            | 726 X LR                     |
| (A) | 2 EA  | MAGNETIC HOLDERS  | 2100 (incl. exten. if req'd) |

Card Reader/Keypad by Access Control Contractor.

#### HW-4

|     |      |             |                 |
|-----|------|-------------|-----------------|
| (H) | 1 EA | HINGE       | 780-224HD EPT   |
| (V) | 1 EA | EXIT DEVICE | RX 99L X E996L  |
| (S) | 1 EA | CLOSER      | 4551 X CS X SNB |

|     |       |                |                       |
|-----|-------|----------------|-----------------------|
| (H) | 1 EA  | KICK PLATE     | 190S 10 X DW LESS 2"  |
| (H) | 1 EA  | STOP           | 232W OR 243F AS REQ'D |
| (V) | 1 EA  | POWER TRANSFER | EPT-10                |
| (V) | 1 EA  | POWER SUPPLY   | PS902                 |
| (H) | 1 SET | GASKET         | 726 X LR              |

Card Reader/Keypad by Access Control Contractor.

#### **HW-5**

|     |       |            |                       |
|-----|-------|------------|-----------------------|
| (H) | 3 EA  | HINGES     | BB1168 4 ½ X 4 ½      |
| (B) | 1 EA  | LOCK       | 45H7 R 15R            |
| (S) | 1 EA  | CLOSER     | 4551 X CS X SNB       |
| (H) | 1 EA  | KICK PLATE | 190S 10 X DW LESS 2"  |
| (H) | 1 EA  | STOP       | 232W OR 243F AS REQ'D |
| (H) | 1 SET | GASKET     | 726 X LR              |

#### **HW-6**

|     |       |             |                      |
|-----|-------|-------------|----------------------|
| (H) | 6 EA  | HINGES      | BB1168 4 ½ X 4       |
| (V) | 1 EA  | EXIT DEVICE | 9927L                |
| (V) | 1 EA  | EXIT DEVICE | 9927EOF              |
| (B) | 2 EA  | CYLINDERS   | 1E72                 |
| (S) | 2 EA  | CLOSER      | 4551 X CS X SNB      |
| (H) | 2 EA  | KICK PLATE  | 190S 10 X DW LESS 2" |
| (H) | 2 EA  | STOP        | 232W                 |
| (H) | 1 SET | GASKET      | 726 X LR             |

#### **HW-7**

|     |       |         |                  |
|-----|-------|---------|------------------|
| (H) | 3 EA  | HINGES  | BB1279 4 ½ X 4 ½ |
| (B) | 1 EA  | PASSAGE | 45H0 N 15R       |
| (H) | 1 EA  | STOP    | 232W             |
| (H) | 1 SET | GASKET  | 726 X LR         |

#### **HW-8**

|     |       |        |                  |
|-----|-------|--------|------------------|
| (H) | 3 EA  | HINGES | BB1279 4 ½ X 4 ½ |
| (B) | 1 EA  | LOCK   | 45H7 AB 15R      |
| (H) | 1 EA  | STOP   | 232W             |
| (H) | 1 SET | GASKET | 726 X LR         |

#### **HW-9**

|     |       |                |                      |
|-----|-------|----------------|----------------------|
| (H) | 3 EA  | HINGES         | BB1279 4 ½ X 4 ½     |
| (B) | 1 EA  | PASSAGE        | 45H0 N 15R           |
| (S) | 1 EA  | INDICATOR LOCK | L496 X L583-363 LC   |
| (B) | 1 EA  | CYLINDER       | 1E74                 |
| (S) | 1 EA  | CLOSER         | 4551 X HCS X SNB     |
| (H) | 1 EA  | KICK PLATE     | 190S 10 X DW LESS 2" |
| (H) | 1 SET | GASKET         | 726 X LR             |

#### **HW-10**

|     |      |           |                  |
|-----|------|-----------|------------------|
| (H) | 3 EA | HINGES    | BB1279 4 ½ X 4 ½ |
| (B) | 1 EA | LOCK      | 45H7 AB 15R      |
| (H) | 1 EA | STOP      | 232W             |
| (H) | 3 EA | SILENCERS | 307D             |

**HW-11**

|     |       |            |                       |
|-----|-------|------------|-----------------------|
| (H) | 3 EA  | HINGES     | BB1168 4 ½ X 4 ½      |
| (B) | 1 EA  | PASSAGE    | 45H0 N 15R            |
| (S) | 1 EA  | CLOSER     | 4551 X CS X SNB       |
| (H) | 1 EA  | KICK PLATE | 190S 10 X DW LESS 2"  |
| (H) | 1 EA  | STOP       | 232W OR 243F AS REQ'D |
| (H) | 1 SET | GASKET     | 726 X LR              |

**HW-12**

|     |       |            |                      |
|-----|-------|------------|----------------------|
| (H) | 3 EA  | HINGES     | BB1279 4 ½ X 4 ½ NRP |
| (B) | 1 EA  | LOCK       | 45H7 D 15R           |
| (S) | 1 EA  | CLOSER     | 4551 X SNB           |
| (H) | 1 EA  | KICK PLATE | 190S 10 X DW LESS 2" |
| (H) | 1 SET | GASKET     | 726 X LR             |

**HW-13**

|     |       |            |                       |
|-----|-------|------------|-----------------------|
| (H) | 3 EA  | HINGES     | BB1279 4 ½ X 4 ½ NRP  |
| (B) | 1 EA  | LOCK       | 45H7 R 15R            |
| (S) | 1 EA  | CLOSER     | 4551 X H X SNB        |
| (H) | 1 EA  | KICK PLATE | 190S 10 X DW LESS 2"  |
| (H) | 1 SET | GASKET     | 726 X LR              |
| (H) | 1 EA  | STOP       | 232W OR 243F AS REQ'D |

**HW-14**

|     |       |                |                      |
|-----|-------|----------------|----------------------|
| (H) | 8 EA  | HINGES         | BB1191 4 ½ X 4 ½ NRP |
| (V) | 1 EA  | EXIT DEVICE    | RX 9927L X E996L     |
| (V) | 1 EA  | EXIT DEVICE    | 9927EO               |
| (V) | 1 EA  | POWER TRANSFER | EPT-10               |
| (V) | 1 EA  | POWER SUPPLY   | PS902                |
| (B) | 1 EA  | CYLINDERS      | 1E72                 |
| (S) | 2 EA  | CLOSER         | 4551 X HCS X SNB     |
| (H) | 2 EA  | KICK PLATE     | 190S 10 X DW LESS 2" |
| (H) | 2 EA  | STOP           | 267F                 |
| (H) | 1 SET | GASKET         | 891S X SIZE REQUIRED |
| (H) | 1 EA  | THRESHOLD      | 427S X LR            |
| (H) | 2 EA  | DOOR BOTTOM    | 750S X LR            |
| (H) | 1 EA  | DRIP STRIP     | 810S X DW PLUS 4"    |

Card Reader/Keypad by Access Control Contractor.

**HW-15**

|     |       |                |                      |
|-----|-------|----------------|----------------------|
| (H) | 6 EA  | HINGES         | BB1168 4 ½ X 4 ½ NRP |
| (V) | 1 EA  | EXIT DEVICE    | RX 9927L X E996L     |
| (V) | 1 EA  | EXIT DEVICE    | RX 9927EO            |
| (V) | 1 EA  | POWER TRANSFER | EPT-10               |
| (V) | 1 EA  | POWER SUPPLY   | PS902                |
| (B) | 1 EA  | CYLINDERS      | 1E72                 |
| (S) | 2 EA  | CLOSER         | 4551 X HCS X SNB     |
| (H) | 2 EA  | KICK PLATE     | 190S 10 X DW LESS 2" |
| (H) | 2 EA  | STOP           | 232W                 |
| (H) | 1 SET | GASKET         | 726 X LR             |

Card Reader/Keypad by Access Control Contractor.



**HW-16**

|      |       |               |                      |
|------|-------|---------------|----------------------|
| (H)  | 6 EA  | HINGES        | BB1279 4 ½ X 4 ½ NRP |
| (B)  | 1 EA  | LOCK          | 45H7 R 15R           |
| (H)  | 2 EA  | FLUSH BOLT    | 282D-12"             |
| (S)  | 1 EA  | CLOSER        | 4551 X CS X SNB      |
| (H)  | 2 EA  | KICK PLATE    | 190S 10 X DW LESS 2" |
| (SE) | 1 EA  | MAGNETIC LOCK | M450 MBS X DPS       |
| (H)  | 1 SET | GASKET        | 726 X LR             |

Card Reader/Keypad, Power Supply, Push Button and Passive Release by Access Control Contractor.

**HW-17**

|      |      |               |  |
|------|------|---------------|--|
| (H)  | 3 EA | HINGES        | BB1279 4 ½ X 4 ½ NRP                             |
| (SE) | 1 EA | LOCKSET       | 45H7R 15R  |
| (SE) | 1 EA | MAGNETIC LOCK | M450 MBS X DPS (DO NOT<br>CONNECT TO FIRE ALARM) |
| (S)  | 1 EA | CLOSER        | 4551 X SNB                                       |
| (H)  | 1 EA | KICK PLATE    | 190S 10 X DW LESS 2"                             |
| (H)  | 1 EA | STOP          | 232W OR 243F AS REQ'D                            |
| (H)  | 3 EA | SILENCERS     | 307D   |

Card Reader/Keypad Ingress and Egress. Power Supply with Battery Back Up Supplied, and PIR by Access Control. Door to Remain Secure in All Conditions.

**HW-18**

|     |      |                   |                      |
|-----|------|-------------------|----------------------|
| (H) | 2 EA | CONTINUOUS HINGES | 780-224HD            |
| (H) | 2 EA | FLUSH BOLT        | 282D                 |
| (B) | 1 EA | LOCK              | 45H7 G 15R           |
| (S) | 2 EA | CLOSER            | 4551 X SNB           |
| (H) | 2 EA | KICK PLATE        | 190S 10 X DW LESS 1" |
| (H) | 1 EA | THRESHOLD         | 427S                 |
| (H) | 1 EA | GASKET            | 891S                 |
| (H) | 2 EA | SWEEP             | 750S                 |

**HW-19**

|      |       |               |                      |
|------|-------|---------------|----------------------|
| (H)  | 3 EA  | HINGES        | BB1279 4 ½ X 4 ½     |
| (B)  | 1 EA  | LOCK          | 45H7 R 15R           |
| (S)  | 1 EA  | CLOSER        | 4551 X CS X SNB      |
| (H)  | 1 EA  | KICK PLATE    | 190S 10 X DW LESS 2" |
| (SE) | 1 EA  | MAGNETIC LOCK | M450 MBS X DPS       |
| (H)  | 1 SET | GASKET        | 726 X LR             |

Card Reader/Keypad, Power Supply, Push Button and Passive Release by Access Control Contractor.

---END---

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies equipment, controls and accessories for power operated automatic exterior sliding doors.

**1.2 RELATED WORK**

- A. Sealants: Section 07 92 00, JOINT SEALANTS
- B. Aluminum frames entrance work; Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- C. Aluminum Curtain Walls: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
- D. Door hardware; Section 08 71 00, DOOR HARDWARE.
- E. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Section 28 13 00, ACCESS CONTROL.
- G. Glass and glazing of doors and frames; Section 08 80 00, GLAZING.
- H. Electric general wiring, connections and equipment requirements; Division 26, ELECTRICAL.

**1.3 QUALITY ASSURANCE**

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

**1.4 WARRANTY**

- A. Automatic door operators shall be subject to the terms of the "Warranty of Construction" Article of Section 00 72 00, GENERAL CONDITIONS, except that the Warranty period shall be two years in lieu of one year.

**1.5 MAINTENANCE MANUALS**

- A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS", furnish three (3) copies OF maintenance manuals and instructions on automatic door operators.

**1.6 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's literature and data describing operators, power units, controls, door operation, 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.
4. Include plans, elevations, sections, hardware mounting heights, and attachment details.
5. Include hardware schedule and indicate hardware types, functions, quantities, and locations.

D. Submit in writing to Resident Engineer that items listed in Article 1.3 are in compliance.

E. Samples: For each exposed product and for each color and texture specified.

F. Sample Warranties.

G. Operation and Maintenance Data.

**1.7 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**1.8 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.

## **198 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standards Institute (ANSI)  
ICC/ANSI A17.1-03 .....Guidelines for Accessible and Usable Buildings and Facilities –  
Providing Accessibility and Usability for Physically  
Handicapped People.
- C. Builders Hardware Manufacturers Association, Inc. (BHMA):  
A156.10-05 .....Power Operated Pedestrian Doors (BHMA 1601)
- D. National Fire Protection Association (NFPA):  
101-09 .....Life Safety Code
- E. Underwriters Laboratory (UL):  
325-10 .....Door, Drapery, Gate, Louver, and Window Operators and  
Systems

### **1.10 DELIVERY AND STORAGE**

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

## **PART 2 - PRODUCTS**

### **2.1 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.

### **2.2 SLIDING DOOR OPERATORS**

- A. General: Sliding doors shall have electric operators, listed and labeled as defined in NFPA 70, conforming to BHMA A156.10 and the following requirements as applicable. Assembly shall be bi-parting sliding doors as shown on drawings.

- B. Door Operation: Doors shall be opened by electric motor pulling door from closed to open position and shall stop door by electrically reducing voltage and stalling door against mechanical stop. System shall permit manual control of door in event of power failure. Opening and closing speeds shall be adjustable. In compliance with NFPA-101, all door panels shall allow "breakout" to the full open position to provide instant egress at any point in the door's movement.
- C. Operators: Completely assembled and sealed electromechanical operating unit, all located in cast aluminum housing and filled with special lubricant for extreme conditions. Attached to transmission system shall be a minimum 1/8 Hp "DC" shunt-wound permanent magnet motor with sealed ball bearings. Complete unit shall be rubber mounted with provisions for easy maintenance and replacement. Operators shall have adjustable opening and closing cycle. Housing shall be minimum 6063T-5 alloy aluminum not less than .005 mm (125 inch) minimum thickness, 150 mm by 200 mm (6 inch wide by 8 inch high).
- D. Sliding Door Hardware Guide Rollers, Door Carrier: Top door carriers shall ride on steel or delrin rollers incorporating sealed bearings with each door having two support rollers and one anti-rise roller. Each roller shall have a minimum of 9 mm (3/8-inch) of vertical adjustment with positive mechanical locks. Each door shall also include two urethane covered oil impregnated bearing bottom rollers attached with 5 mm (3/16-inch) thick formed steel guide brackets. Each door carrier supporting a door leaf shall include a vertical steel reinforcing member to prevent sagging when door is swung under breakaway conditions. All carbon steel brackets and fittings shall be plated for corrosion resistance.
- E. Locking Hardware: Do not provide any locking hardware at interior doors not requiring physical security. Provide doors with flush concealed vertical rod panic hardware integrated into the doors where physical security is required and free egress is required at all times. Provide doors with manufacturers' standard hookbolt lock (keyed both sides) where physical security is required and free egress is not required at all times. At doors with access control devices (card readers, etc.), provide doors with electronic deadbolt locking to prevent the doors from manually sliding open.
- F. Door Closers: Provide all breakout or swing-out panels with door closers concealed in the top rail of the door.

## 2.3 SLIDING AUTOMATIC ENTRANCES

- A. General: Provide manufacturer's standard automatic entrances including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, controls, and accessories required for a complete installation.
- B. Sliding Automatic Entrance:
  - 1. Configuration: Bi-parting-sliding doors with sidelites.
    - a. Traffic Pattern: Two-way.
    - b. Emergency Breakaway Capability: Sliding leaves and sidelites.
    - c. Mounting: Between jambs.
  - 2. Operator Features:
    - a. Power opening and closing.
    - b. Drive System: Belt.
    - c. Adjustable opening and closing speeds.
    - d. Adjustable hold-open time between zero and 30 seconds.
    - e. Obstruction recycle.
    - f. On-off/hold-open switch to control electric power to operator, key operated.
  - 3. Sliding-Door Carrier Assemblies and Overhead Roller Tracks: Carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered, ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.
    - a. Rollers: Minimum of two ball-bearing roller wheels and two anti-rise rollers for each active leaf.
  - 4. Sliding-Door Threshold: Threshold members and bottom-guide-track system with stainless-steel, ball-bearing-center roller wheels.
    - a. Configuration: Saddle-type threshold across door opening and surface-mounted guide-track system.
  - 5. Finish: Finish framing, door(s), and header with Class I, color anodic finish matching adjacent curtain wall.
    - a. Color: Medium bronze at curtainwall systems.

6. Controls: Activation and safety devices **as indicated on Drawings and** according to BHMA standards.
  - a. Activation Device: **Motion sensor mounted on each side of door header to detect pedestrians in activating zone and Push-plate switch on each side of door** to activate door operator.
  - b. Safety Device: **Presence sensor mounted on each side of door header and two photoelectric beams mounted in sidelite jambs on one side of the door** to detect pedestrians in presence zone and to prevent door from closing.
  - c. Sidelite Safety Device: Presence sensor, mounted above each sidelite on side of door opening through which doors travel, to detect obstructions and to prevent door from opening.

## **2.4 ENTRANCE COMPONENTS**

- A. Framing Members: Extruded aluminum, minimum 0.125 inch (3.2 mm) thick and reinforced as required to support imposed loads.
  1. Nominal Size: 1-3/4 by 6 inches (45 by 150 mm) at curtainwall systems.
- B. Stile and Rail Doors: 1-3/4-inch- (45-mm-) thick, glazed doors with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.
  1. Glazing Stops and Gaskets: Snap-on, extruded-aluminum stops and preformed gaskets.
  2. Stile Design: Medium stile, 3-1/2-inch (90-mm) nominal width.
  3. Rail Design: 10-inch (254-mm) nominal height.
- C. Headers: Fabricated from minimum 0.125-inch- (3.2-mm-) thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
  1. Mounting: Concealed, with one side of header flush with framing..
- D. Signage: As required by cited BHMA standard.
  1. Application Process: Decals.

## **2.5 MATERIALS**

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  1. Extrusions: ASTM B 221 (ASTM B 221M).
  2. Sheet: ASTM B 209 (ASTM B 209M).

- B. Steel Reinforcement: Reinforcement with corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Use surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
- C. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.
- D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
- E. Glazing: As specified in Section 08 80 00 "GLAZING."
- F. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."
- G. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, non-staining grout; complying with ASTM C 1107/C 1107M; of consistency suitable for application.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- I. Fasteners and Accessories: Corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

## **2.6 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.

## **2.7 DOOR CONTROLS**

- A. Opening and closing actions of doors shall be actuated by controls and safety devices specified, and conform to ANSI 156.10. Controls shall cause doors to open instantly when control device is actuated; hold doors in open positions; then, cause doors to close, unless safety device or reactivated control interrupts operation.
- B. Manual Controls:
  - 1. Push Plate Wall Switch: Recess type, stainless steel push plate minimum 100 mm by 100 mm (four-inch by four-inch), with 13 mm (1/2-inch) high letters "To Operate Door--Push" engraved on face of plate, along with the International Symbol of Accessibility.
- C. Motion Detector: The motion detector may be surface mounted or concealed, to provide a signal to actuate the door operator, and monitor the immediate zone, to detect intrusion by persons, carts or similar objects. The zone which the detector monitors shall be 1500 mm (five feet) deep and 1500 mm (five feet) across, plus or minus 150 mm (six inches) on all dimensions. The maximum response time shall be no less than 25 milliseconds. Unit shall be designed to operate on 24 volts AC. The control shall not be affected by cleaning material, solvents, dust, dirt and outdoor weather conditions.



## **2.8 SAFETY DEVICES**

- A. General: Area over which doors swing or slide shall be a safety section and anyone standing in path of door's movement shall be protected by a safety device.
- B. At sliding doors, provide two photoelectric beams mounted at heights of 600 mm (24 inches) and 1200 mm (48 inches) in the door frame on sliding doors. Provide overhead safety presence sensors at door head on each side of the opening. Beams shall parallel door openings to prevent doors from closing when anyone is in the center of the door or doors. When beams are activated, doors shall recycle to full open position. Actuation shall include a motion detector mounted on each side of the door for detection of traffic in each direction.
- C. Provide access control as noted in door hardware schedule.
- D. Time delay switches shall be adjustable between 3 to 60 seconds and shall control closing cycle of doors.
- E. Decals with sign "In" or "Do Not Enter" shall be installed on both faces of each door where shown.
- F. Electrical interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

## **2.9 HARDWARE**

- A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish.
- B. Breakaway Device for Power-Operated Doors: Device that allows door to swing out in direction of egress to full 90 degrees from any operating position. Interrupt powered operation of door operator while in breakaway mode.
- C. Deadlocks: Deadbolt operated by exterior cylinder and interior thumb turn, with minimum 1-inch- (25-mm-) long throw bolt; BHMA A156.5, Grade 1.
  - 1. Cylinders: As specified in Section 087100 "DOOR HARDWARE."
    - a. Keying: Integrate into building master key system.
  - 2. Deadbolts: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.
  - 3. Two-Point Locking for Stile and Rail Sliding Doors: Mechanism in stile of active door leaf that automatically extends second lockbolt into overhead carrier assembly and threshold.
- D. Weather Stripping: Replaceable components.
  - 1. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General: Install automatic entrances according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel, including signage, controls, wiring, and connection to the building's power supply.
  - 1. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.
  - 2. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
  - 3. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous coating.
- B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
  - 1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
  - 2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
  - 3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
- C. 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.
- D. 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.
- E. 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.
- F. Install controls at positions shown and make them convenient for particular traffic expected to pass through openings. Maximum height of push plate wall switches from finished floors shall be 40 inches unless otherwise approved by the Resident Engineer.
- G. Door Operators: Connect door operators to electrical power distribution system.

- H. Access-Control Devices: Connect access-control devices to access-control system as specified in Section 281300 "Access Control."
- I. Controls: Install and adjust activation and safety devices according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- J. Glazing: Install glazing as specified in Section 088000 "Glazing."
- K. Sealants: Comply with requirements specified in Section 079200 "Joint Sealants" to provide weather-tight installation.
  - 1. Set thresholds, and bottom-guide-track system, framing members and flashings in full sealant bed.
  - 2. Seal perimeter of framing members with sealant.
- L. Signage: Apply signage on both sides of each door and breakaway sidelite as required by cited BHMA standard for direction of pedestrian travel.
- M. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

### **3.2 ADJUSTING**

- A. Adjust hardware, moving parts, door operators, and controls to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
- B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

### **3.3 INSTRUCTIONS**

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

- - - E N D - - -

## **SECTION 08 80 00 GLAZING**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This section specifies glass, plastic, related glazing materials and accessories. Glazing products specified apply to factory or field glazed items.

#### **1.2 RELATED WORK**

- A. Factory glazed by manufacturer in following units:
  - 1. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
  - 2. Section 08 41 13, ALUMINUM FRAMED ENTRANCES AND STOREFRONT.
  - 3. Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
  - 4. Color of spandrel glass, tinted (heat absorbing or light reducing) glass, and reflective (metallic coated) glass: Section 09 06 00, SCHEDULE FOR FINISHES.
  - 5. Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEMS.
  - 6. Section 28 16 11, INTRUSION DETECTION SYSTEM.

#### **1.3 LABELS**

- A. Temporary labels:
  - 1. Provide temporary label on each light of glass and plastic material 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 and plastic material is approved by Resident Engineer.
- B. Permanent labels:
  - 1. Locate in corner for each pane.
  - 2. Label in accordance with ANSI Z97.1 and SGCC (Safety Glass Certification Council) label requirements.
    - a. Tempered glass.
    - b. Laminated glass or have certificate for panes without permanent label.
  - 3. Bullet resistance glass or plastic assemblies:
    - a. Bullet resistance glass or plastic assemblies in accordance with UL 752 requirements for power rating specified.
    - b. Identify each security glazing permanently with glazing manufacturer's name, date of manufacture, product number, and DOS Code number inconspicuously located in lower corner on protective side and visible after glazing is framed.

- c. The "attack (threat) side" shall be identified in bold lettering on each side of glazing with removable label.

#### **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 the 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 1300.
- 4. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

##### **C. Bullet resistance glass or plastic assemblies:**

- 1. Spall Resistance: Laminated glazing shall not produce spall to interior (protected side) when impacted with scheduled ballistics.
- 2. Tolerances:
  - a. Outside dimensions: Overall outside dimensions (height and width) of laminated security glazing shall maintain tolerance of  $\pm 3$  mm.
  - b. Warpage: Out-of-flat (warpage or bowing) condition of laminates shall not exceed 2.5 mm per lineal meter. The condition, if present, shall be localized to extent not greater than 0.75 mm for any 0.3 meter section.
- 3. Coordinate with Physical Security Design Manual requirements.

#### **1.5 SUBMITTALS**

##### **A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.**

##### **B. Manufacturer's Certificates:**

- 1. Certificates stating that non-wire glass, meets requirements for safety glazing material as specified in ANSI Z97.1 and UL.
- 2. Certificate on shading coefficient.
- 3. Certificate on "R" value when value is specified.
- 4. Certificate test reports confirming compliance's with specified bullet resistive rating.

- C. Warranty: Submit written guaranty, conforming to General Condition requirements, and to “Warranty of Construction” Article in this Section.
- D. Manufacturer's Literature and Data:
  - 1. Glass, each kind required.
  - 2. Insulating glass units.
  - 3. Transparent (one-way vision glass) mirrors.
  - 4. Glazing cushion.
  - 5. Sealing compound.
  - 6. Bullet resistive material.
  - 7. Plastic glazing material, each type required.
- E. Samples:
  - 1. Glass: Provide 305 mm by 305 mm (12 inches by 12 inches) samples for each type of glass indicated, except for clear monolithic glass products.
  - 2. Sealant / Gasket: Provide 305 mm (12 inch) long samples of color required, except black, for each type of sealant or gasket exposed to view.
- F. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Test and Evaluation Reports: Glazing contractor shall obtain compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealant as well as other glazing materials including insulating units.
- H. Manufacturer Reports: Submit Glass Fabricator's Shop Drawing Review indicating compliance with glazing standards established by the Glass Association of North America (GANA). Submittal to include thermal stress and structural load analysis of the proposed glass types, configuration and sizes.
- I. Sustainable Design Submittals: Submit manufacturer's documentation verifying product content, origin or other attributes for projects requiring special sustainability provisions, to meet the USGBC's project's sustainable goals.

#### **1.6 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and

applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™  
CERTIFICATION

**1.7 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 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 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.

## **1.8 PROJECT CONDITIONS**

Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

## **1.9 WARRANTY**

- A. Warranty: Conform to terms of "Warranty of Construction", Article in Section 00 72 00, GENERAL CONDITIONS, except extend warranty period for the following:
1. Bullet resistive plastic material to remain visibly clear without discoloration for 10 years.
  2. Polycarbonate to remain clear and ultraviolet light stabilized for 5 years.
  3. Insulating plastic to not have more than 6 percent decrease in light transmission and be ultraviolet light stabilized for 10 years.
  4. Provide a written 10-year warranty from date of substantial completion for sputter coated glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions.
  5. Provide a written 5-year warranty from date of substantial completion for laminated glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions.
  6. Provide a written 10-year warranty (vertical application) or 5-year warranty (sloped application) from date of substantial completion for insulating glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, protecting and maintaining practices contrary to the glass manufacturer's published instructions.
  7. Provide a written 5-year warranty from date of substantial completion for ceramic frit glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions.
  8. Provide a written 5-year warranty from date of substantial completion for Reflective Spandrel Glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions.
  9. Provide a written 5-year warranty from date of substantial completion for fully tempered glass that has been Heat Soaked. Warrants that heat soaked tempered glass will not break spontaneously as a result of Nickel Sulfide (NiS) inclusions at a rate exceeding 0.5% (5/1000) for a period of five years from the date of substantial completion.

## **1.10 QUALITY ASSURANCE:**

- A. Qualifications:



1. Manufacturers: Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, silk-screening and tempering shall be manufactured by a single manufacturer with a minimum of ten (10) years of fabrication experience and meet ANSI / ASQC 9002 1994.
- B. Mock-ups: Before glazing, build mockups for each glass product indicated to verify selections and to demonstrate aesthetic effects and qualities of materials and execution.
  1. Construction: Build mockups with glass and glazing systems specified for the project, including typical lite size, framing systems and glazing methods.
  2. Scheduling: Notify Resident Engineer seven days in advance of dates and times when mockups will be available for viewing.
  3. Quality Assurance: Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work. Accepted mockups may become part of the completed work if undisturbed at the time of substantial completion.
- C. Publications: Comply with recommendations in the publications below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or in Article 1.2 References.
  1. GANA Glazing Manual
  2. GANA Engineering Standards Manual
  3. GANA Laminated Glazing Reference Manual

#### **1.11 APPLICABLE PUBLICATIONS**

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

C794-06 .....Adhesion-in-Peel of Elastomeric Joint Sealants.

C864-05 .....Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

C920-08 .....Elastomeric Joint Sealants.

C1036-06 .....Flat Glass.

- C1048-04 .....Heat-Treated Flat Glass-Kind HS, Kind FT Coated and  
Uncoated Glass.
- C1115-06 .....Dense Elastomeric Silicone Ribber Gaskets and Accessories
- C1172-09 .....Laminated Architectural Flat Glass.
- C1376-10 .....Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- E84-09.....Surface Burning Characteristics of Building Materials.
- E546-08.....Standard Test Method for Frost/Dew Point of Sealed Insulated  
Glass Units
- E576-08.....Standard Test Method for Frost/Dew Point of Sealed Insulated  
Glass Units in the Vertical Position.
- E1300-09.....Determining Load Resistance of Glass in Buildings.
- E2190-08.....Insulating Glass Unit
- D. Commercial Item Description (CID):
  - A-A-59502 .....Plastic Sheet, Polycarbonate
- E. Code of Federal Regulations (CFR):
  - 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; 1977, with 1984 Revision.
- F. National Fire Protection Association (NFPA):
  - 80-08 .....Fire Doors and Windows.
- G. National Fenestration Rating Council (NFRC)
- H. Safety Glazing Certification Council (SGCC)2009:
  - Certified Products Directory (Issued Semi-Annually).
- I. Underwriters Laboratories, Inc. (UL):
  - 752-06 .....Bullet-Resisting Equipment.
- J. Glass Association of North America (GANA):
  - Glazing Manual (Latest Edition)
  - Sealant Manual (2008)
- K. American Society of Civil Engineers (ASCE):
  - ASCE 7-10 .....Wind Load Provisions

## **PART 2 - PRODUCT**

### **2.1 DESCRIPTION**

- A. Provide glazing systems capable of withstanding normal thermal movements, wind loads and impact loads, without failure, including loss due to defective manufacture, fabrication and installation; deterioration of glazing materials; and other defects in construction.

### **2.2 PERFORMANCE / DESIGN CRITERIA**

- A. Glass Strength: Analysis shall comply with ASTM E 1300 Determining Load Resistance of Glass in Buildings. Provide glass products in the thickness and strengths (annealed or heat-treated) required to meet or exceed the following criteria based on project loads and in-service conditions.
1. Minimum thickness of annealed or heat-treated glass products to be selected so the worst case probability of failure does not exceed the following:
    - a. 8 breaks per 1000 for glass installed vertically or not 15 degrees or more from the vertical plane and under wind action.
    - b. 1 break per 1000 for glass installed 15 degrees or more from the vertical plane and under action of wind and/or snow.
  2. Deflection must be limited to prevent disengagement from the frame and be less than or equal to 1" (25mm).
- B. Thermal and Optical Performance: Provide glass products with performance properties specified. Performance properties to be manufacturer's published data as determined according to the following procedures:
1. Center of glass U-Value: NFRC 100 methodology using LBNL WINDOW 5.2 computer program.
  2. Center of glass solar heat gain coefficient: NFRC 200 methodology using LBNL-35298 WINDOW 5.2 computer program.
  3. Solar optical properties: NFRC 300
  4. Visible Reflectance: Center-of-Glazing values, according to NFRC 300.
  5. ASTM C 1048 Heat Treated Flat Glass, Kind HS or FT (remove ASTM Standard C 1048 if annealed glass), Condition A (uncoated), B (spandrel glass, one surface coated), or C (other coated glass).
    - a. Heat Treated Flat Glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.
    - b. Maximum peak to valley rollerwave 0.003" (0.08mm) in the central area and 0.008" (0.20mm) within 10.5" (267mm) of the leading and trailing edge.
    - c. Maximum bow and warp 1/32" per lineal foot (0.79mm).
    - d. All tempered architectural safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.

## **2.3 GLASS**

- A. Use thickness stated unless specified otherwise in assemblies.

B. Clear Glass:

1. ASTM C1036, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

C. Tinted Heat reflective and low emissivity coated glass:

1. ASTM C1036, Type I, Class 2, Quality q3.
2. Color: Refer to Specification Section 09 06 00, SCHEDULE FOR FINISHES.
3. Thickness, 6 mm (1/4 inch).

## **2.4 HEAT-TREATED GLASS**

A. Clear Heat Strengthened Glass:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

B. Tinted Heat Strengthened Glass:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 2, Quality q3.
2. Color: Refer to Specification Section 09 06 00, SCHEDULE FOR FINISHES.
3. Thickness, 6 mm (1/4 inch).

C. Clear Tempered Glass:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

D. Tinted Tempered Glass:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 2, Quality q3.
2. Color: Refer to Specification Section 09 06 00, SCHEDULE FOR FINISHES.
3. Thickness, 6 mm (1/4 inch).

## **2.5 COATED GLASS**

A. Spandrel Glass:

1. ASTM C1048, Kind HS, Condition B, Type I.
2. Thickness, 6 mm (1/4 inch) each side (inboard and outboard lites).
3. Coating on #2 and #3 surfaces.
4. Spacer:
  1. Nominal Thickness: 1-1/2"
  2. Gas Fill: Air
5. Glass Strength: Tempered each side (inboard and outboard lites).
6. Color: Refer to Specification Section 09 06 00, SCHEDULE FOR FINISHES.

B. Reflective Tempered Glass:

1. ASTM C1048, Kind FT, Condition C, Type I, Class 1, Quality q3 with reflective metallic coating, having nominal values of 25 percent day light, 30 percent solar, and 7.9 percent ultraviolet transmittance within three percent plus or minus.
2. Coating on #2 surface of insulating glass units.
3. Thickness, 6 mm (1/4 inch).
4. Color: Refer to Specification Section 09 06 00, SCHEDULE FOR FINISHES.

C. 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, 6 mm (1/4 inch).

D. Ceramic Coated Vision Glass:

1. ASTM C1048, Kind HS or FT, Condition C, Type I, Class 1, Quality q3 with ceramic coating applied by silk-screen process.
2. Color / Pattern: Refer to Specification Section 09 06 00, SCHEDULE FOR FINISHES.
3. Apply coating to second surface of monolithic glass and to second surface of insulating glass units.
4. Thickness, 6 mm (1/4 inch).

E. Ceramic Coated Spandrel Glass:

1. ASTM C1048, Kind HS or FT, Condition B, Type I, Class 1, Quality q3 with ceramic coating applied over and fused into glass surface.
2. Color / Pattern: Refer to Specification Section 09 06 00, SCHEDULE FOR FINISHES.
3. Apply coating to second surface.
4. Thickness, 6 mm (1/4 inch).

## **2.6 LAMINATED GLASS**

A. General:

1. Shall comply with ASTM C-1172 Standard Specification for Laminated Architectural Flat Glass.
2. All laminated architectural safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.
3. Laminated Glass products shall be fabricated free of foreign substances and air or glass pockets in autoclave with heat plus pressure.

B. Two or more lites of glass bonded with an interlayer material for use in building glazing

C. Colored Interlayer:

1. Use color interlayer ultraviolet light color stabilization.
2. Option: Use colored interlayer with clear glass in lieu of tinted glass and clear interlayer.
3. The interlayer assembly shall have uniform color presenting same appearance as tinted glass assembly.

D. Use 1.5 mm (0.060 inch) thick interlayer for:

1. Horizontal or Sloped glazing.
2. Heat strengthened or fully tempered glass assemblies.

E. 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.

## **2.7 LAMINATED GLAZING ASSEMBLIES**

A. Clear Tempered Glazing:

1. Both panes ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
2. Thickness: Each pane 4.8 mm (3/16 inch) thick.

## **2.8 BULLET RESISTIVE ASSEMBLY**

- A. Provide protection listed by UL ABPMED as bullet resisting, with a power rating of Super-Power Small Arms ballistic level in accordance with UL 752.
- B. Fabricate from Type I, Class 1, Quality q3 glass with polyvinyl butyral plastic interlayers between the layers of glass.

## **2.9 GLASS CLAD POLYCARBONATE SECURITY GLAZING ASSEMBLY**

- A. Use 1.3 mm (0.050 inch) polyurethane sheeting for interlayer between glass and polycarbonate.
- B. Clear Tempered Glass Clad Polycarbonate:
1. Use ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3, 3 mm (1/8 inch) thick outer glass panes.
  2. Use clear polycarbonate sheet, 3 mm (1/8 inch) thick core.
  3. Thickness, 11 mm (7/16 inch).
- C. Maximum Allowable Area: Laminated glazing shall not exceed 1.32 meter square (14 square feet) unless glazing has been certified.

## **2.10 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.
1. Units shall be certified for compliance by the IGCC in accordance with the above ASTM test method.

- B. Shall comply with ASTM E 546 Standard Test Method for Frost Point of Sealed Insulating Glass Units
- C. Shall comply with ASTM E 576 Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position
- D. Sealed Insulating Glass Units to be double sealed with a primary seal of polyisobutylene and a secondary seal of silicone.
  - 1. The minimum thickness of the secondary seal shall be 1/16" (1.59mm).
  - 2. The target width of the primary seal shall be 5/32" (3.97mm).
  - 3. There shall be no voids or skips in the primary seal.
  - 4. Up to a maximum of 3/32" of the airspace may be visible above the primary polyisobutylene sealant.
  - 5. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16" (1.59mm) by maximum length of 2" (51mm) with gaps separated by at least 18" (457mm). Continuous contact between the primary seal and the secondary seal is desired.
- E. To provide a hermetically sealed and dehydrated space, lites shall be separated by an aluminum spacer with three bent corners and one keyed-soldered corner or four bent corners and one straight butyl injected zinc plated steel straight key joint.
- F. Assemble units using glass types specified:
- G. Sealed Edge Units (SEU):
  - 1. Insulating Glass Unit Makeup
    - a. Outboard Lite
      - 1. Glass type: Tinted fully tempered float glass.
      - 2. Glass Tint: Refer to Specification Section 09 06 00, SCHEDULE FOR FINISHES
      - 3. Nominal Thickness: 1/4-inch
      - 4. Glass Strength: Tempered
    - b. Spacer
      - 1. Nominal Thickness: 1/2-inch
      - 2. Gas Fill: Air
    - c. Inboard Lite
      - 1. Glass Type: Clear fully tempered float glass.
      - 2. Glass Tint: Refer to Specification Section 09 06 00, SCHEDULE FOR FINISHES
      - 3. Nominal Thickness: 1/4-inch
      - 4. Glass Strength: Tempered
    - d. Coating Orientation: Low-e coating on second surface.

2. Performance Characteristics (Center of Glass)
  - a. Visible Transmittance: 62% (Maximum)
  - b. Summer U-Factor (U-Value): 0.26 (Maximum)
  - c. Winter U-factor (U-value): 0.43 (Maximum)
  - d. Shading Coefficient (SC): .33 (Maximum)
  - e. Solar heat Gain Coefficient (SHGC): 0.25 (Maximum)
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.

## **2.11 FIRE RESISTANT GLASS WITHOUT WIRE MESH**

- A. Fire resistant glass or glass assembly classified by UL in Building Materials Directory or other approved testing laboratory bearing permanent mark of classification.
  1. Test according to NFPA 252 for Door Assemblies and NFPA 257 for Window Assemblies.
  2. UL listing R13377-1, 4.8 mm (3/16 inch) thick, unpolished complying with testing requirements in 16 CFR 1201 for Category II Materials.
  3. Rating: To match rating of component in which the glass occurs.

## **2.1 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.
  1. Glazing Materials: Select glazing sealants, tapes, gaskets and additional glazing materials of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
- B. Setting Blocks: ASTM C864:
  1. Channel shape; having 6 mm (1/4 inch) internal depth, 100% Silicone.
  2. Shore a hardness of 80 to 90 Durometer.
  3. Block lengths: 50 mm (two inches) except 100 to 150 mm (four to six inches) for insulating glass.
  4. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
  5. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.
- C. Spacers: ASTM C864:



1. Channel shape having a 6 mm (1/4 inch) internal depth.
2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
3. Lengths: One to 25 to 76 mm (one to three inches).
4. Shore a hardness of 40 to 50 Durometer.

D. Sealing Tapes:

1. Semi-solid polymeric based material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.

E. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.

F. Glazing Gaskets: ASTM C864 or C1115:

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.
4. Must be compatible with glazing sealants.
5. Profile and hardness required to maintain a weathertight seal.

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.
5. Use NT.
6. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

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.
3. Profile and hardness required to maintain a watertight seal.

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.

J. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

## **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. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- F. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- G. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- H. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- I. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- J. Provide spacers for glass lites where length plus width is larger than **50 inches (1270 mm)**.
- K. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- L. Glaze doors in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.
- M. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- N. Laminated Glass:
  - 1. Tape edges to seal interlayer and protect from glazing sealants.
  - 2. Do not use putty or glazing compounds.
- O. 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.
- P. Fire Resistant Glass:
  - 1. Other Non-Wire Fire Resistant Glass: Glaze in accordance with UL design requirements.

**Q. Bullet Resisting Material:**

1. Glaze as recommended by manufacturer, using glazing material which will permit expansion and contraction of the bullet resistive material in the frame.
2. The polycarbonate surface shall not be cleaned by scraping, razor blade, squeegee, or use of highly alkaline cleaner. At no time shall polycarbonate material be exposed to chemical solvents (benzene, gasoline, acetone, paint thinners) or aromatic hydrocarbons (toluene or xylene), nor shall any of these solvents or fumes be used or present in confined areas. Due care shall be exercised (paint formula, ventilation, protection of polycarbonate) when painting becomes necessary to interiors of rooms of hardline glazed units; exposure to chemical solvents could result in irreparable damage to security glazings (delaminations, distortions, cracks, severe stress crazing, air bubbles).

**3.4 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)**

- A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
- F. Fill gap between glazing and stop with 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.

**3.5 INSTALLATION - WET METHOD (SEALANT AND SEALANT)**

- A. Place setting blocks at 1/4 points and install glazing pane or unit.
- B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- C. Fill gaps between glazing and stops with silicone type sealant to depth of bite on glazing, but not more than 9 mm (3/8 inch) below sight line to ensure full contact with glazing and continue the air and vapor seal.
- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

### **3.6 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)**

- A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- E. Fill gaps between pane and applied stop with silicone type sealant to depth equal to bite on glazing, to uniform and level line.
- F. Trim protruding tape edge.

### **3.7 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)**

- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 600 mm (24 inch) centers, kept 6 mm (1/4 inch) below sight line.
- B. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

### **3.8 REPLACEMENT AND CLEANING**

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by Resident Engineer.
- B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.
- C. Leave glass and setting material in clean, whole, and acceptable condition.
- D. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by the glass manufacturer.

### **3.9 PROTECTION**

- A. Protect finished surfaces from damage during erection, and after completion of work by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface.. Strippable plastic coatings on colored anodized finish are not acceptable.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

### **3.10 GLAZING SCHEDULE**

- A. See the Drawings for glazing type descriptions and locations.

B. Fire Resistant Glass:

1. Install clear non-wire, fire-resistant glass in interior fire rated or labeled doors and windows.

C. 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, unless otherwise indicated or specified, on exterior doors and sidelights unless otherwise indicated or specified.
4. Use tinted tempered glass to match adjacent window system.
5. Use SEU Low E tinted and tempered and clear tempered insulating glass on storefront, curtainwall, and sidelights where indicated on the Drawings.
6. Use SEU, Low E tinted, reflective tempered and clear insulated tempered glass on storefront, curtainwall, and sidelights where indicated on the Drawings.

D. Clear Tempered Glass:

1. Interior observation windows not specified otherwise.

E. Insulating Glass:

1. Install SEU, Low E clear insulating tempered glass in exterior windows, storefronts, and curtain walls, where indicated on the Drawings.
2. Install SEU Low E tinted tempered and clear tempered insulating glass in exterior windows, storefronts, and curtain walls where indicated on the Drawings.

F. Laminated Glass: Install as specified in doors and windows where indicated.

G. Bullet Resisting Assembly, Install specified assembly in service windows at Pharmacy Dispensing Windows.

H. Spandrel Glass: Install specified spandrel glazing where indicated.

- - - E N D - - -

**SECTION 08 83 00**  
**MIRRORS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes the following types of silvered flat glass mirrors:
  - 1. Tempered glass mirrors qualifying as safety glazing.

**1.2 RELATED WORK**

- A. Glass in Door and Window Systems: Section 08 80 00, GLAZING
- B. Toilet Accessories: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
- C. Samples:
  - 1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
  - 2. Mirror Clips: Full size.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Warranty: Sample of special warranty.

**1.6 CLOSEOUT SUBMITTALS**

- A. Maintenance data.

## **1.7 QUALITY ASSURANCE**

- A. Glazing Publications: Comply with GANA's "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Safety Glazing Products: For Tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
- C. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.

## **1.8 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
  - 1. Warranty Period: Five years (minimum) from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 SILVERED FLAT GLASS MIRRORS**

- A. Glass Mirrors, General: ASTM C 1503[; manufactured using copper-free, low-lead mirror coating process].
- B. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.
  - 1. Nominal Thickness: 6.0 mm (1/4-inch).

### **2.2 MISCELLANEOUS MATERIALS**

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Approved by mirror manufacturer.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors.
  - 1. Adhesive shall have a VOC content of not more than [70] <Insert number> g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile



Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

**2.3 FABRICATION**

- A. Cutouts: Fabricate cutouts before tempering for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- B. Mirror Edge Treatment: Flat polished. Seal edges of mirrors with edge sealer.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
  - 1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.
- B. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.
- C. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- D. Wall-Mounted Mirrors: Install mirrors with mastic. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
- E. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- F. Do not permit edges of mirrors to be exposed to standing water.
- G. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- H. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

- - - END - - -

**SECTION 08 90 00**  
**LOUVERS AND VENTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies fixed and operable wall louvers and wall vents.

**1.2 RELATED WORK**

- A. 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 for each type, showing material, finish, size of members, operating devices, method of assembly, and installation and anchorage details.
- C. Manufacturer's Literature and Data for each type of louver and vent.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**1.4 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. The Master Painters Institute (MPI):  
Approved Product List – September 2011
- C. American Society for Testing and Materials (ASTM):  
B209/B209M-03(R2007).....Aluminum and Aluminum Alloy, Sheet and Plate  
B221-08 .....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire,  
Shapes, and Tubes

B221M-07 ..... Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire  
Shapes, and Tubes

D1187-97 ..... Asphalt-Based Emulsions for Use as Protective Coating for  
Metal.

D. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06 ..... Metal Finishes Manual

E. National Fire Protection Association (NFPA):

90A-09 ..... Installation of Air Conditioning and Ventilating Systems

G. American Architectural Manufacturers Association (AAMA):

2605-11 ..... High Performance Organic Coatings on Architectural Extrusions  
and Panels

H. Air Movement and Control Association, Inc. (AMCA):

500-L-07 ..... Testing Louvers

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Aluminum, Extruded: ASTM B221/B221M.
- B. Aluminum, Plate and Sheet: ASTM B209/B209M.
- C. Fasteners: Fasteners for securing louvers and wall vents to adjoining construction, except as otherwise specified or shown, shall be toggle or expansion bolts, of size and type as required for each specific type of installation and service condition.
  - 1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.
  - 2. Fasteners for louvers, louver frames, and wire guards shall be of stainless steel or aluminum.
- D. Inorganic Zinc Primer: MPI No. 19.
- E. Bituminous Paint: Cold-Applied Asphalt Emulsion complying with ASTM D187.

### **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 44 percent free area and shall pass 500 fpm free area velocity at a pressure drop not exceeding 0.05 inch water gage and carry not more than 0.0 g (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 2 mm (0.081-inch) and blades 1.6 mm (0.063-inch) thick 6063T5 extruded aluminum. Blades shall be double drainable, sight-proof, wind-driven rain resistant type and have reinforcing bosses.
2. Louvers, fixed: Make frame sizes 1/4-inch smaller than openings. Single louvers frames shall not exceed 120 inches wide x 90 inches high. When openings exceed 120 inches, provide twin louvers separated by mullion members.

## **2.3 CLOSURE ANGLES AND CLOSURE PLATES**

- A. Fabricate from 2 mm (0.074-inch) thick stainless steel or aluminum.
- B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.
- C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as specified.

## **2.4 WIRE GUARDS**

- A. Provide wire guards (bird screen) on outside of all exterior louvers.
- B. Frame shall be removable and add no more than 1/2 inch to louver depth.
- C. Screen shall be not less than 0.625 inch x 0.040-inch expanded flattened aluminum square mesh.

## **2.5 FINISH**

- A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505
- B. Aluminum Louvers and Wire Guards:
  1. Anodized finish
    - a. AA-C22A42 Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick.

NOTE: AA-C22A44 Chemically etched medium matte, with electronically deposited metallic compound, Class I Architectural, 0.7 mils thick may be provided as an option for AA-C22A42 color anodic coating. Dyes will not be accepted.

## **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. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.
- C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work. Strippable plastic coating on colored anodized finish is not approved.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.
- C. Provide anchoring devices and fasteners as shown and as necessary for securing louvers and vents to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use. Use concealed anchorages where possible.
- D. Generally, set wall louvers and vents in masonry walls during progress of the work. If wall louvers and vents are not delivered to job in time for installation in prepared openings, make provision for later installation. Set in cast-in-place concrete in prepared openings.

### **3.2 CLEANING AND ADJUSTING**

- A. After installation, all exposed prefinished and plated items and all items fabricated from aluminum shall be cleaned as recommended by the manufacturer and protected from damage until completion of the project.
- B. All movable parts, including hardware, shall be cleaned and adjusted to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have all contact surfaces fit tight and even without forcing or warping the components.
- C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by the Resident Engineer, remove damaged units and replace with new units.

---END---

**SECTION 09 06 00**  
**SCHEDULE FOR FINISHES**

**PART I – GENERAL**

**1.1 DESCRIPTION**

This section contains a coordinated system in which requirements for materials specified in other sections shown are identified by abbreviated material names and finish codes in the room finish schedule or shown for other locations.

**1.2 MANUFACTURERS**

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

**1.3 SUBMITALS**

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

**1.4 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.
- B. MASTER PAINTING INSTITUTE: (MPI)
  - 2001 .....Architectural Painting Specification Manual

## **PART 2- PRODUCTS**

### **2.1 DIVISION 03 – CONCRETE**

#### **A. SECTION 03 45 00, PRECAST ARCHITECTURAL CONCRETE**

| Finish Color | Texture | Finish                             | Manufacturer                               | Color Identification<br>Plate Name/No. |
|--------------|---------|------------------------------------|--|--|
| White        | Light   | Acid Etched on Exposed<br>Surfaces | Architectural Precast<br>Association (APA) | #127                                   |

#### **B. SECTION 03 49 00, GLASS FIBER REINFORCED CONCRETE**

| Finish Color                                    | Texture | Manufacturer          |
|---|---------|-----------------------|
| To Match Existing Cast Concrete of Building 170 | Smooth  | Metrocast Corporation |

### **2.2 DIVISION 04 – MASONRY**

#### **A. Section 04 05 13, MASONRY MORTARING**

| Finish Code    | Manufacturer | Mfg. Color Name                                     |
|----------------|--------------|---|
| Not Applicable | SPEC Mix     | To Match Existing Mortar on Building 170 (Exterior) |
| Not Applicable | SPEC Mix     | Standard Gray (Interior)                            |

#### **B. Section 04 20 00, UNIT MASONRY**

| 1. FACE BRICK (FB) |  |              |                        |                                       |
|--------------------|--|--------------|------------------------|---------------------------------------|
| Finish Code        | Size   | Pattern      | Manufacturer           | Mfg. Color Name/No.                   |
| Not Applicable     | Heritage King Size (2-3/4" x<br>2-5/8" x 5/8") | Running Bond | Acme, Fort Smith Plant | Blend 100, Plaza<br>Heights Handcraft |



| 2. WEEPS /VENTS     |                              |                       |                                 |
|---------------------|------------------------------|-----------------------|---------------------------------|
| Manufacturer        | Material                     | Model #               | Color                           |
| Hohmann and Barnard | Cellular Plastic Weep / Vent | #0V Quadro-Vent       | To Be Selected by the Architect |
| Mortar Net          | Mesh Weep / Vent             | Mortar Net Weep Vents | To Be Selected by the Architect |

| 3. CAVITY DRAINAGE MATERIAL |                               |            |                                 |
|-----------------------------|-------------------------------|------------|---------------------------------|
| Manufacturer                | Material                      | Model #    | Color                           |
| Mortar Net                  | Mesh Cavity Drainage Material | Mortar Net | To Be Selected by the Architect |

## 2.3 DIVISION 05 – METALS

### A. SECTION 05 12 13, ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

| Component | Finish   | Color   |
|-----------|--|---|
| Column    | Intumescent Paint / Finish Paint Smooth Finish Surface | General Contractor to Submit Sample to VA Interior Designer for Selection |

### B. SECTION 05 50 00, METAL FABRICATION

| Item                                    | Finish  |
|---|---|
| Modular Channel Units                   | Paint to be Determined, and Prefinished, Painted Manufacturer's Standard Colors   |
| Channel Door Frames                     | Paint – General Contractor to Submit Sample to VA Interior Designer for Selection |
| Guard Angles for Overhead Doors         | Paint – General Contractor to Submit Sample to VA Interior Designer for Selection |
| Edge Guards Angles for Opening in Slabs | Paint – General Contractor to Submit Sample to VA Interior Designer for Selection |

|   |   |
|---|---|
| Steel Covers and Frames for pits and trenches     | Paint – General Contractor to Submit Sample to VA Interior Designer for Selection   |
| Cast Iron Covers and Frames for Pits and Trenches | Natural   |
| Steel Grating and Frames                          | Galvanized  |
| Aluminum Gratings and Frames                      | Mill Finish   |
| Steel Plank Gratings                              | Exterior – Galvanized / Interior – Paint. To Be Determined  |
| Cast Iron Gratings                                | Natural   |
| Loose Lintels                                     | Paint – General Contractor to Submit Sample to VA Interior Designer for Selection   |
| Steel Plate Door Sill                             | Galvanized  |
| Aluminum Plate Door Sill                          | Mill Finish   |
| Aluminum Safety Nosing                            | Cast Aluminum, MYSTROM STCA-CAC   |
| Steel Ladders                                     | Exterior and Elevator Pit Ladders – Galvanized. Finish Paint Color to be Determined. Interior – Paint – To Be Determined. |
| Steel Pipe Railings (not on Steel Stairs)         | Paint – To Be Determined  |
| Steel Pipe Bollards                               | Paint – To Be Determined  |

C. SECTION 05 51 00, METAL STAIRS

| Component   | Finish  | Color   |
|-------------|---|---|
| Guard Rails | Exterior – Galvanized Paint<br>Interior - Paint | Exterior – Finish To Be Determined<br>Interior – To Be Determined       |
| Handrails   | Exterior – Galvanized Paint<br>Interior - Paint | Exterior – Finish Color to be Determined<br>Interior – To Be Determined |
| Stringers   | Rubber  | To Be Determined  |
| Risers      | Rubber  | To Be Determined  |
| Underside   | Paint   | To Be Determined  |

## 2.4 DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

### A. SECTION 06 16 00, FLEXIBLE FLASHING

| Component                | Manufacturer | Product                                 |
|--------------------------|--------------|---|
| Flexible Flashing System | Dupont TYVEK | Dupont Flexwrap<br>Dupont Straightflash |

### B. SECTION 06 41 16, PLASTIC LAMINATE-FACED ARCHITECTURAL CABINETS

| Room Name and Number | Component                     | Material         | Manufacturer | Finish   | Color          |
|----------------------|-------------------------------|------------------|--------------|----------|----------------|
| 1. Men<br>GQ-020     | Countertop,<br>Nose, Splashes | Solid Surface    | Corian       | Standard | Fawn           |
|                      | Exposed Surfaces              | Plastic Laminate | Pointe       | Suede    | At Fold Pannin |
|                      | Semi-Exposed<br>Interiors     | Thermoset Panels | White        | White    | White          |

| Room Name and Number | Component                     | Material         | Manufacturer | Finish   | Color          |
|----------------------|-------------------------------|------------------|--------------|----------|----------------|
| 2. Women<br>GQ-021   | Countertop,<br>Nose, Splashes | Solid Surface    | Corian       | Standard | Fawn           |
|                      | Exposed Surfaces              | Plastic Laminate | Pointe       | Suede    | At Fold Pannin |
|                      | Semi-Exposed<br>Interiors     | Thermoset Panels | White        | White    | White          |

| Room Name and Number | Component                     | Material         | Manufacturer | Finish   | Color          |
|----------------------|-------------------------------|------------------|--------------|----------|----------------|
| 3. Men<br>GQ-144     | Countertop,<br>Nose, Splashes | Solid Surface    | Corian       | Standard | Fawn           |
|                      | Exposed Surfaces              | Plastic Laminate | Pointe       | Suede    | At Fold Pannin |
|                      | Semi-Exposed<br>Interiors     | Thermoset Panels | White        | White    | White          |

| Room Name and Number | Component                     | Material         | Manufacturer | Finish   | Color          |
|----------------------|-------------------------------|------------------|--------------|----------|----------------|
| 4. Women<br>GQ-145   | Countertop,<br>Nose, Splashes | Solid Surface    | Corian       | Standard | Fawn           |
|                      | Exposed Surfaces              | Plastic Laminate | Pointe       | Suede    | At Fold Pannin |
|                      | Semi-Exposed<br>Interiors     | Thermoset Panels | White        | White    | White          |

C. SECTION 06 64 00, PLASTIC PANELING

| Component                     | Manufacturer | Manufacturer Product Line | Color, Texture  |
|-------------------------------|--------------|---------------------------|---|
| Plastic Sheet Paneling System | Marlite FRP  | Standard FRP              | General Contractor to Submit<br>Sample to VA Interior Designer<br>for Selection |

## 2.5 DIVISION 07 – THERMAL AND MOISTURE PROTECTION

### A. SECTION 07 40 00, SIDING PANELS

| Type   | Manufacturer | Manufacturer Product Line /<br>Model No. | Color, Texture   |
|--|--------------|--|--|
| Insulated Metal Wall Panel<br>System (Behind Metal Wall<br>Panels) | Centria      | Metal Wrap 100 Series                    | Inner Face: Manufacturer's<br>Standard Primer Coat<br>Outer Face: Manufacturer's<br>Standard Primer Coat |
| Insulated Metal Wall Panel<br>System (Behind Brick Veneer)         | Centria      | Metal Wrap 200 Series                    | Inner Face: Manufacturer's<br>Standard Primer Coat<br>Outer Face: Manufacturer's<br>Standard Primer Coat |

### B. SECTION 07 41 50, COMPOSITE METAL BUILDING PANELS

| Manufacturer | System Type         | Color  |
|--------------|---------------------|--|
| Alucobond    | Rout and Return Wet | To be Determined as selected from<br>Manufacturer's full metallic PVDF color<br>palette. |

### C. SECTION 07 54 19, POLYVINYL-CHLORIDE (PVC) ROOFING

| Manufacturer | Color |
|--------------|-------|
| Duro-Last    | White |

D. SECTION 07 60 00, FLASHING AND SHEET METAL

| Material                           | Color  |
|------------------------------------|--|
| Stainless Steel                    | Natural  |
| Clear Finish Aluminum              | Clear Anodized Coating to Match Component Adjacent |
| Color Finish Aluminum              | Color Anodized Coating to Match Component Adjacent |
| Fluorocarbon Finish Aluminum       | Color to be Determined by Architect                |
| Mill Finish Aluminum               | Natural  |
| Painted Steel and Galvanized Steel | Color to be Determined by Archigect                |

E. SECTION 07 92 00, JOINT SEALANTS

| Location                  | Color               | Manufacturer                  | Manufacturer Color            |
|---------------------------|---------------------|-------------------------------|-------------------------------|
| Masonry Expansion Joints  | To be Determined    | To be Determined by Architect | To be Determined by Architect |
| CMU Control Joints        | Standard Gray       | To be Determined by Architect | To be Determined by Architect |
| Precast Concrete Joints   | Match Precast       | To be Determined by Architect | To be Determined by Architect |
| New to Existing Walls     | To be Determined    | To be Determined by Architect | To be Determined by Architect |
| Building Expansion Joints | To be Determined    | To be Determined by Architect | To be Determined by Architect |
| Masonry Sealed Joints     | Match Mortar Color  | To be Determined by Architect | To be Determined by Architect |
| Cement Panel Joints       | Match Cement Panels | To be Determined by Architect | To be Determined by Architect |

F. SECTION 07 95 13, EXPANSION JOINT COVER ASSEMBLIES

|  | Material          | Finish                  | Manufacturer  | Mfg. Color Name/No.  |
|--|-------------------|-------------------------|---------------|--|
| Floor Component<br>Cover Plate Frame<br>Casket or Sealant<br>(interior only) | Extruded Aluminum | Manufacturer's Standard | The C/S Group | ALR – 300 with FB (Floor-Floor)<br>ALRW-300 with FB (Floor-Wall)       |
| Wall Component Cover<br>Plate Frame Casket or<br>Sealant (interior only)     | Extruded Aluminum | Manufacturer's Standard | The C/S Group | FWA 300 (Wall-Wall)<br>FWAC-300 (Corner Wall)<br>ALRW-300 (Floor-Wall) |

|  | Material   | Finish                  | Manufacturer  | Mfg. Color Name/No.  |
|--|--|-------------------------|---------------|--|
| Ceiling Component Cover<br>Plate, Gasket or Sealant<br>(interior only)       | Extruded Aluminum (Lay-In and Gyp. Bd.)          | Manufacturer's Standard | The C/S Group | Lay-In-Ceiling<br>FCF-300 (Field)<br>FCFC-300 (Wall)                                 |
|  |  |                         |               | Gyp. Bd Ceiling<br>FWF-300 (Field)<br>FWFC-300 (Wall)                                |
| Exterior Wall and top of<br>Parapet Cover Plate Frame<br>Thermoplastic Joint | Extruded Aluminum and<br>Extruded Flexible Seals | Manufacturer's Standard | The C/S Group | SC-300 (Wall to Wall)<br>SRJ-300 with FB (Roof-Roof)<br>SRJW-300 with FB (Wall-Roof) |

## 2.6 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   | Sherwin Williams – Semi-Gloss |
| Door  | PT-1 Softer Tan SW6141        |
| Frame   | PT-1 Softer Tan SW6141        |
| Window frame  | PT-1 Softer Tan SW6141        |

### B. SECTION 08 14 00, WOOD DOORS

|           |  |
|-----------|--|
| Component | Finish/Color   |
| Doors     | Pre-Finish – General Contractor to Submit Sample to VA Interior Designer for Selection |

### C. SECTION 08 31 13, ACCESS DOORS AND FRAMES

|                 |                                       |
|-----------------|---------------------------------------|
| Material        | Finish/Color                          |
| Steel           | To be Determined by Interior Designer |
| Stainless steel | No. 4 Finish                          |

### D. SECTION 08 33 00, COILING DOORS AND GRILLES

|                   |               |                  |        |                             |
|-------------------|---------------|------------------|--------|-----------------------------|
| Location          | Item          | Material         | Finish | Manufacturer Color Name/No. |
| Mechanical GQ-018 | Door          | Galvanized Steel | Paint  | To be Determined            |
|                   | Hood / Fascia | Galvanized Steel | Paint  | To be Determined            |



E. SECTION 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

| Component                 | Material | Finish  | Manufacturer | Manufacturer Name/No. |
|---------------------------|----------|---|--------------|-----------------------|
| Frame                     | Aluminum | Dark Bronze Anodized and Medium Bronze Anodized | Kawneer      | 451UT                 |
| Doors                     | Aluminum | Dark Bronze Anodized and Medium Bronze Anodized | Kawneer      | 451UT                 |
| Sunshade Outrigger System |          | Match Storefront                                | Kawneer      | Versoleil Sunshade    |

F. SECTION 08 44 13, GLAZED ALUMINUM CURTAIN WALLS

| Component | Material | Finish  | Manufacturer | Mfg. Name/No. |
|-----------|----------|---|--------------|---------------|
| Frame     | Aluminum | Dark Bronze Anodized and Medium Bronze Anodized | Kawneer      | 1600 UT       |
| Doors     | Aluminum | Dark Bronze Anodized and Medium Bronze Anodized | Kawneer      | 1600 UT       |

G. SECTION 08 71 00, DOOR HARDWARE

| Item                     | Material                      | Finish                  |
|--------------------------|-------------------------------|-------------------------|
| Hinges                   | Steel                         | Satin Chrome – BHMA 626 |
| Door Closers             | Steel / Plastic               | Paint – BHMA 689        |
| Drip Strip               | Stainless Steel               | Satin – BHMA 626        |
| Floor Stops / Wall Stops | Stainless Steel / Gray Rubber | Satin – BHMA 626        |
| Door Bottom              | Stainless Steel / Neoprene    | Satin – BHMA 626        |
| Lock/ Latches            | Brass                         | Satin Chrome – BHMA 626 |

| Item            | Material                         | Finish  |
|-----------------|----------------------------------|---|
| Key Cabinet     | Steel                            | Paint – General Contractor to Submit Samples for Selection    |
| Power Transfer  | Steel                            | Satin Chrome – BHMA 626                                       |
| Kick Mop Plates | Stainless Steel                  | BHMA 630  |
| Door Astragal   | Steel                            | Satin Chrome – BHMA 626                                       |
| Exit Device     | Brass / Bronze / Stainless Steel | Satin Chrome – BHMA 626                                       |
| Flush Bolts     | Steel                            | Satin Chrome – BHMA 626                                       |
| Door Pulls      | Stainless Steel                  | Satin – BHMA 626  |
| Push Plates     | Stainless Steel                  | Satin – BHMA 626  |
| Indicator Lock  | Stainless Steel                  | Satin – BHMA 626  |
| Coordinators    | Steel                            | Satin Chrome – BHMA 626                                       |
| Silencer        | Gray Rubber                      | Not Applicable  |
| Weather Strip   | Black or Gray Neoprene           | Not Applicable  |
| Threshold       | Aluminum                         | Mill Finish, Dark Bronze Anodized, and Medium Bronze Anodized |

#### H. SECTION 08 71 13, AUTOMATIC DOOR OPERATORS

| Component | Material | Finish  | Manufacturer | Manufacturer Name/No.                      |
|-----------|----------|---|--------------|--|
| Frame     | Aluminum | Dark Bronze Anodized and Medium Bronze Anodized | Horton       | Proslide Series 2003                       |
| Doors     | Aluminum | Dark Bronze Anodized and Medium Bronze Anodized |              | Belt Drive Type 310, Biparting SO-SX-SX-SO |

I. SECTION 08 80 00, GLAZING

| Glazing Type | Manufacturer | Mfg. Color Name/No.   |
|--------------|--------------|---|
| GL-1         | Viracon      | Bronze Tint VNE4 – 63, 1” Insulating HS/HS, Low “E”                       |
| GL-2         | Viracon      | Clear Tint VNE1 – 63, 1” Insulating HS/HS, Low “E”                        |
| GL-3         | Viracon      | 1/4” Bronze Tint VNE – 63 #2 HS   |
| GL-4         | Viracon      | 1/4” Clear Tint VNE – 63 #2 H/S   |
| GL-5         | Viracon      | 1” Insulated Tempered Spandrel Glass. Each Pane to Match GL-1 Tint Color  |
| GL-6         | Viracon      | 1” Insulated Tempered Spandrel Glass. Each Pane to Match GL-2 Tint Color. |
| GL-7         | Viracon      | 1/4” Clear Tempered Glass   |
| GL-8         | Binswanger   | 1/4” Tempered Mirror  |
| GL-9         | TPG          | 3/16” Fire Lite NT  |

J. SECTION 08 90 00, LOUVERS AND VENTS

| Component                | Material | Finish   |
|--------------------------|----------|--|
| Louvers and Vents (Wall) | Aluminum | Color Anodized Finish – General Contractor to Submit Samples for Selection |

## 2.7 DIVISION 09 - FINISHES

### A. SECTION 09 30 13, CERAMIC / PORCELAIN TILING

| 1. PORCELAIN CERAMIC FLOOR TILE (CT) |         |        |                            |              |                     |
|--------------------------------------|---------|--------|----------------------------|--------------|---------------------|
| Color                                | Size    | Shape  | Pattern                    | Manufacturer | Mfg. Color Name/No. |
| Desert Sand                          | 12 X 12 | Square | Alta Vista Lay on Diagonal | Daltile      | AV50                |

| 2. PORCELAIN CERAMIC WALL TILE (CWT) |         |        |                          |              |                     |
|--------------------------------------|---------|--------|--------------------------|--------------|---------------------|
| Color                                | Size    | Shape  | Pattern                  | Manufacturer | Mfg. Color Name/No. |
| Desert Sand                          | 12 X 12 | Square | Alta Vista Lay on Square | Daltile      | AV50                |

| 3. PORCELAIN CERAMIC WALL TILE Boarder(CWTB) |                            |        |   |                |                                |
|--|----------------------------|--------|---|----------------|--------------------------------|
| Color  | Size                       | Shape  | Pattern                                   | Manufacturer   | Mfg. Color Name/No.            |
| To Be Determined                             | 4 X 12 Deco BL99 Universal | Square | Refer to Elevation for Tile Border Layout | American Olean | Belmar Glazed – BL99412DECO1P2 |

| 4. SECTION 09 30 13, CERAMIC TILE GROUT |              |                    |
|---|--------------|--------------------|
| Finish Code                             | Manufacturer | Mfg. Color Name/No |
| Ceramic Tile (Floor)                    | Laticrete    | 35 Mocha           |
| Tile (Wall)                             | Laticrete    | 17 Marble Beige    |

| 5. SECTION 09 30 13, MARBLE THRESHOLDS |              |                     |
|--|--------------|---------------------|
| Marble Type                            | Manufacturer | Mfg. Color Name/No. |
| Solid Surface                          | Corian       | To Be Determined    |

B. SECTION 09 51 00, ACOUSTICAL CEILINGS

| Finish Code | Component                 | Color Pattern                    | Manufacturer | Mfg Name/No. |
|-------------|---------------------------|----------------------------------|--------------|--------------|
| MSS         | Exposed Suspension System | White                            | Armstrong    | Prelude XL   |
| ACT         | Type III Ceiling Panel    | White, Beveled Tegular,<br>2 x 2 | Armstrong    | 704 Cortega  |

C. SECTION 09 65 13, RESILIENT BASE STAIR TREADS AND ACCESSORIES

| Finish Code    | Item                         | Height         | Manufacturer     | Mfg Name/No.     |
|----------------|------------------------------|----------------|------------------|------------------|
| RB             | Rubber Base (RB)             | 4"             | To be Determined | To be Determined |
| RST            | Resilient Stair Treads (RST) | Not Applicable | To be Determined | To be Determined |
| Not Applicable | Resilient Molding            | Not Applicable | To be Determined | To be Determined |

D. SECTION 09 65 19, RESILIENT TILE FLOORING (Larger Samples shall be Submitted to the Interior Designer for Confirmation)

| Finish Code | Size    | Material/Component     | Manufacturer           | Mfg Name/No.                                |
|-------------|---------|------------------------|------------------------|---|
| VCT         | 12 x 12 | VCT                    | Armstrong & Mannington | VCT-1 & VCT-2 Refer to<br>Floorscape Design |
| LVT         | 6 x 36  | Vinyl Plank Wood Grain | Teknoflor              | LVT-1, LVT-2 Refer to<br>Floorscape Design  |
| RT          | 12 x 12 | RT                     | To be Determined       | To be Determined                            |

E. SECTION 09 68 00, CARPETING (Larger Samples shall be Submitted to the Interior Designer for Confirmation)

| 1. SECTION 09 68 00, CARPET TILE (CPT) |         |                                  |              |   |
|--|---------|----------------------------------|--------------|---|
| Finish Code                            | Size    | Pattern direction                | Manufacturer | Mfg. Color Name/No.                     |
| CPT Tile                               | 24 x 24 | ¼ Turn Installation Pattern Loop | Shaw         | Radiance EW24 Color To<br>Be Determined |

| 2. SECTION 09 68 00, CARPET EDGE STRIP |          |              |                     |  |
|--|----------|--------------|---------------------|--|
| Finish Code                            | Material | Manufacturer | Mfg. Color Name/No. |  |
| Not Applicable                         | Rubber   | Johnsonite   | 66 Either Ore       |  |

F. 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<br>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.   |
|----------------------------|----------------|---|---|
| Walls                      | Eg-Shell       | Sherwin Williams Promar 200<br>Zero VOC Interior      | PT-1 Field SW6241<br>PT-2 – SW2927 & PT-3 SW7736<br>PT-4 SW0012<br>Accent Wall Colors |
| Door Trim                  | Semi-Gloss     | Sherwin Williams Proclassic<br>Interior Acrylic Latex | PT-1 S@6141   |
| 3. Clear coatings Code(CC) | Gloss          | Manufacturer  | Mfg. Color Name/No.   |
| CC                         | Not Applicable | To be Determined                                      | To be Determined  |

**NOTE: CONTRACTOR TO PROVIDE 8 X 10 PAINT DRAW DOWNS FOR VA DESIGNER APPROVAL IN ALL FINISHES.**

## 2.8 DIVISION 10 - SPECIALTIES

### A. SECTION 10 11 14, SIGNAGE

| Component           | Note  | Manufacturer                  | Mfg. Color Name/No.                                   |
|---------------------|---|-------------------------------|---|
| Live Safety Signage | Signage Types, Final Signage Colors, Finishes, Copy and Graphics to be Submitted for Approval | Creative Signage System, Inc. | Fire Red Background with White Copy and Graphics      |
| General Signage     | Signage Types, Final Signage Colors, Finishes, Copy and Graphics to be Submitted for Approval | Creative Signage System, Inc. | Subsurface: Match New B.170<br>Frame: Match New B.170 |
| Overhead Signage    | Signage Types, Final Signage Colors, Finishes, Copy and Graphics to be Submitted for Approval | Creative Signage System, Inc. | 2" Match New Watermark Logo Applied                   |

### B. SECTION 10 21 13, TOILET COMPARTMENTS

| Room Name and Number | Manufacturer      | Mfg. Color Name/No. |
|----------------------|-------------------|---------------------|
| Men GQ-020           | Scranton Products | Bronze Hammered     |
| Women GQ-021         | Scranton Products | Bronze Hammered     |
| Women IQ-144         | Scranton Products | Bronze Hammered     |
| Men IQ-145           | Scranton Products | Bronze Hammered     |

### C. SECTION 10 26 00, WALL GUARDS AND CORNER GUARDS

| Item          | Material | Manufacturer | Mfg. Color Name/No.   |
|---------------|----------|--------------|---|
| Corner Guards | Vinyl    | Acrovyn      | 150 High Impact Corner Guard.<br>CG-1 Solid Color and<br>CG-2 Woodgrain Pattern |



D. SECTION 10 28 00, TOILET AND BATH ACCESSORIES

| Item                 | Material                      | Manufacturer | Mfg. Color Name/No.                        |
|----------------------|-------------------------------|--------------|--|
| Under-Lavatory Guard | Anti-Microbial Molded Plastic | TRUEBRO      | Lavguard 2 Undersink Piping Covers - White |

E. SECTION 10 44 13, FIRE EXTNGUISHER CABINETS

| Component           | Material              | Finish  |
|---------------------|-----------------------|---|
| Body                | Steel                 | Interior of Cabinet – Semi-Gloss White Enamel<br>Field Paint Exterior Trim Components – Color to be Determined. |
| Door / Vision Panel | Steel / Clear Acrylic | Field Paint Steel Components of Door. Color to be Determined.   |

**2.9 DIVISION 11 – EQUIPMENT**

A. SECTION 11 31 00, RESIDENTIAL APPLIANCES

| Type           | Manufacturer     | Model #     | Finish Color     |
|----------------|------------------|-------------|------------------|
| Refrigerator   | General Electric | GTH18KBXWW  | White (on White) |
| Microwave Oven | General Electric | PEB2060DMWW | White (on White) |

**2.10 DIVISION 12- FURNISHINGS**

A. SECTION 12 36 61, SIMULATED STONE WINDOW SILLS

| Manufacturer   | Color and Texture |
|----------------|-------------------|
| DuPont, Corian | To be Determined  |

B. SECTION 12 36 61, SIMULATED STONE COUNTERTOPS

| Manufacturer   | Color and Texture                        |
|----------------|--|
| DuPont, Corian | To be Determined by VA Interior Designer |

C. SECTION 12 56 70, INTEGRATED MODULAR MEDICAL SUPPORT SYSTEMS - SELECTIONS MADE BY VA INTERIOR DESIGNER

| Component   | Manufacturer             | Mfg. Color Name/No.   |
|---|--------------------------|---|
| Panel System / Ethospace / HM Casework (MillCare)           | Herman Miller Healthcare | Wood grain cherry finish tiles and metallic metal finish tiles with Corian transaction tops and Corian tops at wet areas. |
| Horizontal Support  | Herman Miller Healthcare | Metal Paint Finish  |
| Vertical Support  | Herman Miller Healthcare | Metal Paint Finish  |
| Work Surfaces   | Herman Miller Healthcare | HP Laminate wood grain and/or HP Laminate fiber color   |
| Materials Handling Components                               | Herman Miller Healthcare | Metal Paint Finish  |
| Shelving Systems (Shelf Storage Units) A02<br>HM Casework   | Herman Miller Healthcare | Metal Paint Finish<br>HP Wood Grain Cherry Laminate   |
| Filing (Modular Storage) Meridian                           | Herman Miller Healthcare | Metal Metallic Paint Finish   |
| Nurse Station – Ethospace                                   | Herman Miller Healthcare | Wood grain cherry finish tiles and metal metallic finish tiles and colored HP laminates.                                  |
| Display Surfaces  | Herman Miller Healthcare | Metallic Metal Finish and Fabric Group A  |
| Accessories (Keyboard Tray, Monitor Post, Locks and Keying) | Herman Miller Healthcare | Metallic Finish   |
| Lighting  | Herman Miller Healthcare | Metallic Finish   |

## 2.11 DIVISION 13 - SPECIAL CONSTRUCTION (NOT USED)

## 2.12 DIVISION 14 – CONVEYING EQUIPMENT

### A. SECTION 14 21 00, ELECTRIC TRACTION ELEVATORS

| Elevator            | Manufacturer / Model                            | Component                                    | Material        | Finish | Color                   |
|---------------------|---|--|-----------------|--------|-------------------------|
| Passenger Elevators | Otis Elevator Company, GEN 2, 5000#, 200 F.P.M. | Hoistway Entrance                            | Stainless Steel | Satin  | Manufacturer's Standard |
|                     |   | Hoistway Doors                               | Stainless Steel | Satin  | Manufacturer's Standard |
|                     |   | Corridor Position Indicator and Call Buttons | Stainless Steel | Satin  | Manufacturer's Standard |
|                     |   | Car Canopy                                   | Steel           |        | To be Determined        |
|                     |   | Car Wainscot                                 | Stainless Steel | Satin  | Manufacturer's Standard |
|                     |   | Panels Above Wainscot                        | Stainless Steel | Satin  | Manufacturer's Standard |
|                     |   | Car Floor                                    | Steel           | SVT    | Match Existing B.170    |
|                     |   | Car Operating Panel                          | Stainless Steel | Satin  | Manufacturer's Standard |
|                     |   | Car Enclosure                                | Stainless Steel | Satin  | Manufacturer's Standard |
|                     |   | Car Ceiling                                  | Stainless Steel | Satin  | Manufacturer's Standard |

## PART III EXECUTION

### 3.1 FINISH SCHEDULES & MISCELLANEOUS ABBREVIATIONS

| FINISH SCHEDULE & MISCELLANEOUS ABBREVIATIONS |              |
|---|--------------|
| Term  | Abbreviation |
| Access Flooring                               | AF           |
| Accordion Folding Partition                   | AFP          |
| Acoustical Ceiling                            | AT           |
| Acoustical Ceiling, Special Faced             | AT (SP)      |
| Acoustical Metal Pan Ceiling                  | AMP          |
| Acoustical Wall Panel                         | AWP          |
| Acoustical Wall Treatment                     | AWT          |
| Acoustical Wallcovering                       | AWF          |
| Anodized Aluminum Colored                     | AAC          |
| Anodized Aluminum Natural Finish              | AA           |
| Baked On Enamel                               | BE           |
| Brick Face                                    | BR           |
| Brick Flooring                                | BF           |
| Brick Paving                                  | BP           |
| Carpet  | CP           |
| Carpet Athletic Flooring                      | CAF          |
| Carpet Module Tile                            | CPT          |
| Ceramic Glazed Facing Brick                   | CGFB         |
| Ceramic Mosaic Tile                           | FTCT         |
| Ceramic Tile                                  | CT           |
| Concrete                                      | C            |
| Concrete Masonry Unit                         | CMU          |
| Corner Guard                                  | CG           |
| Divider Strips Marble                         | DS MB        |

|                               |        |
|-------------------------------|--------|
| Epoxy Coating                 | EC     |
| Epoxy Resin Flooring          | ERF    |
| Existing                      | E      |
| Exposed Divider Strips        | EXP    |
| Exterior                      | EXT    |
| Exterior Finish System        | EFS    |
| Exterior Paint                | EXT-P  |
| Exterior Stain                | EXT-ST |
| Fabric Wallcovering           | WF     |
| Facing Tile                   | SCT    |
| Feature Strips                | FS     |
| FireRetardant Coatings        | CC     |
| Floor Mats & Frames           | FM     |
| Floor Tile, Mosaic            | FT     |
| Fluorocarbon                  | FC     |
| Folding Panel Partition       | FP     |
| Foot Grille                   | FG     |
| Glass Masonry Unit            | GUMU   |
| Glazed Face CMU               | GCMU   |
| Glazed Structural Facing Tile | SFTU   |
| Granite                       | GT     |
| Gypsum Wallboard              | GWB    |
| High Glazed Coating           | SC     |
| Latex Mastic Flooring         | LM     |
| Linear Metal Ceiling          | LMC    |
| Linear Wood Ceiling           | LWC    |
| Marble                        | MB     |
| Material                      | MAT    |
| Metal Suspension System       | MSS    |
| Mortar                        | M      |
| Multi-Color Coating           | MC     |

|  |      |
|--|------|
| Natural Finish                           | NF   |
| Paint                                    | P    |
| Paver Tile                               | PVT  |
| Perforated Metal Facing (Tile or Panels) | PMF  |
| Plaster                                  | PL   |
| Plaster High Strength                    | HSPL |
| Plaster Keene Cement                     | KC   |
| Plastic Laminate                         | HPDL |
| Polypropylene Fabric Wallcovering        | PFW  |
| Porcelain Paver Tile                     | PPT  |
| Quarry Tile                              | QT   |
| Radiant Ceiling Panel System             | RCP  |
| Resilient Stair Tread                    | RST  |
| Rubber Base                              | RB   |
| Rubber Tile Flooring                     | RT   |
| Solid Vinyl Tile                         | SVT  |
| Spandrel Glass                           | SLG  |
| Stain                                    | ST   |
| Stone Flooring                           | SF   |

|                                     |     |
|-------------------------------------|-----|
| Structural Clay                     | SC  |
| Suspension Decorative Grids         | SDG |
| Terrazzo Portland Cement            | PCT |
| Terrazzo Tile                       | TT  |
| Terrazzo, Thin Set                  |     |
| Textured Gypsum Ceiling Panel       | TGC |
| Textured Metal Ceiling Panel        | TMC |
| Thin set Terrazzo                   | TST |
| Veneer Plaster                      | VP  |
| Vinyl Base                          | VB  |
| Vinyl Coated Fabric Wallcovering    | W   |
| Vinyl Composition Tile              | VCT |
| Vinyl Sheet Flooring                | VSF |
| Vinyl Sheet Flooring (Welded Seams) | WSF |
| Wall Border                         | WB  |
| Wood                                | WD  |

### 3.2 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

--- E N D---

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

- A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
- B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- C. Wood Blocking for Wall Mounted Items: Section 06 10 00, ROUGH CARPENTRY.
- D. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS// Section 09 29 00, GYPSUM BOARD.

**1.3 TERMINOLOGY**

- A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM 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 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. "Equivalent" thicknesses are not acceptable.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Studs, runners and accessories.
  - 2. Hanger inserts.
  - 3. Channels (Rolled steel).
  - 4. Furring channels.
  - 5. Screws, clips and other fasteners.
- C. Shop Drawings:
  - 1. Typical ceiling suspension system.

2. Typical metal stud and furring construction system including details around openings and corner details.
3. Typical shaft wall assembly
4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.

D. Test Results: Fire rating test designation, each fire rating required for each assembly.

## **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.6 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE**

In accordance with the requirements of ASTM C754.

## **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)
- |                     |  |
|---------------------|--|
| A123-09 .....       | Zinc (Hot-dip Galvanized) Coatings on Iron and Steel Products  |
| A653/A653M-11 ..... | 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<br>Screw-Attached Gypsum Panel Products   |
| C840-11 .....  | Application and Finishing of Gypsum Board  |
| C954-07 .....  | Steel Drill Screws for the Application of Gypsum Panel Products<br>or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to<br>0.112 in. (2.84 mm) in Thickness |
| C1002-07 ..... | Steel Self-Piercing Tapping Screws for the Application of<br>Gypsum Panel Products or Metal Plaster Bases to Wood Studs or<br>Steel Studs                                |
| E119-12.....   | Fire Tests of Building Construction and Materials.   |
| E580-09.....   | Application of Ceiling Suspension Systems for Acoustical Tile<br>and Lay-in Panels in Areas Requiring Moderate Seismic<br>Restraint.                                     |

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

Fire-Test Response Characteristics: Provide materials and construction identical to those tested according to ASTM 119.

### **2.2 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 A123.

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

- A. ASTM C645, modified for thickness specified and sizes as shown.
  1. Use ASTM A653 steel, 0.9 mm (0.0359-inch) thick bare metal (20-gauge) minimum.
  2. Runners same thickness as studs.
  3. Stud Spacing shall be 400 mm (16-inch) on center (maximum) unless noted otherwise.
- B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.
- C. Doubled studs for openings and studs for supporting concrete backer-board.
- D. Studs 3600 mm (12 feet) or less in length shall be in one piece.
- E. Shaft Wall Framing:
  1. Conform to rated wall construction.
  2. C-H Studs.
  3. E Studs.



- 4. J Runners.
- 5. Steel Jamb-Strut.
- F. Rated Wall Construction: Provide minimum stud requirements as identified in the applicable standards for the particular rated wall construction encountered.

## **2.3 FURRING CHANNELS**

- A. Rigid furring channels (hat shape): ASTM C645.
- B. Resilient furring channels:
  - 1. Not less than 0.45 mm (0.0179-inch) thick bare metal (22 gauge).
  - 2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface to which other channel leg is attached.
- C. "Z" Furring Channels:
  - 1. Not less than 0.45 mm (0.0179-inch)-thick bare metal (26 gauge), with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.
  - 2. Web furring depth to suit thickness of insulation with slotted perforations.
- D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C840, cold rolled.
- E. Rated Wall Construction: Provide minimum furring channel requirements identified in the applicable standards for the particular rated wall construction encountered.

## **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 C840, 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 C840.
- G. Attachments for Wall Furring:
  - 1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.

2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.
- H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.
- I. Cold-Rolled Channel Bridging:
1. Steel, 0.053 inch (1.34 mm) minimum base-metal thickness, with minimum 12-inch (13mm) wide flanges.
  2. Depth: Minimum 1-1/2 inches (38mm)
  3. Clip Angle: Not less than 1-1/2 inch by 1-1/2 inch (38mm by 38mm) 0.068-inch (1.72mm) thick, galvanized steel.
- J. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt or foam gasket.

## **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 C840 regarding details of construction shall not apply.
- C. Do not bridge building control and expansion joints with non-load bearing steel framing members. Frame both sides of joints independently.

### **3.2 INSTALLING STUDS**

- A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.
- B. Space studs not more than 400 mm (16 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. Unless specifically noted, all studs are to extend 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.
- K. Fire=Resistance Rated Partitions: Install framing to comply with Fire-Resistance-Rated Assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

### **3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY**

- A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.

**B. Wall furring-Stud System:**

1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.

**C. Direct attachment to masonry or concrete; rigid channels or "Z" channels:**

1. Install rigid (hat section) furring channels at 400 mm (16 inches) on center, horizontally or vertically.
2. Install "Z" furring channels vertically spaced not more than 400 mm (16 inches) on center.
3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.
6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.

**D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.**

**3.4 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES**

- A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.
- B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

**3.5 INSTALLING SHAFT WALL SYSTEM**

- A. Conform to UL Design No. U438 for two-hour fire rating, unless noted otherwise.
- B. Position J runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural supports with power driven fasteners at both ends and 600 mm (24 inches) on center.

- C. After liner panels have been erected, cut C-H studs and E studs, from 9 mm (3/8-inch) to not more than 13 mm (1/2-inch) less than floor-to-ceiling height. Install C-H studs between liner panels with liner panels inserted in the groove.
- D. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.
- E. Suitably frame all openings to maintain structural support for wall:
  - 1. Provide necessary liner fillers and shims to conform to label frame requirements.
  - 2. Frame openings cut within a liner panel with E studs around perimeter.
  - 3. Frame openings with vertical E studs at jambs, horizontal J runner at head and sill.
- F. Elevator Shafts:
  - 1. Conform to UL Design No. U419 for two-hour fire rating.
  - 2. Frame elevator door frames with 0.87 mm (0.0341-inch) thick J strut or J stud jambs having 75 mm (three-inch) long legs on the shaft side, matching studs in depth.
  - 3. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
  - 4. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

### **3.6 INSTALLING FURRED AND SUSPENDED CEILINGS OR SOFFITS**

- A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.
  - 1. Space framing at 400 mm (16-inch) centers for metal lath anchorage.
  - 2. Space framing at 400 mm (16-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.

### **3.7 TOLERANCES**

- A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
- B. Plumb and align vertical members within 3 mm (1/8-inch.)
- C. Level or align ceilings within 3 mm (1/8-inch.)

- - - E N D - - -

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

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This section specifies installation and finishing of interior and exterior gypsum board.

#### **1.2 RELATED WORK**

- A. Roof Substrate and Protection Board: Section 07 22 00, ROOF AND DECK INSULATION.
- B. Roofing Membrane: Section 07 54 19, POLYVINYL-CHLORIDE (PVC) ROOFING.
- C. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- D. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.
- 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. Corner bead and edge trim.
  - 2. Finishing materials.
  - 3. Laminating adhesive.
  - 4. Gypsum board, each type.
  - 5. Miscellaneous Accessories.
- C. Shop Drawings:
  - 1. Typical interior gypsum board installation, showing corner details, edge trim details and the like for each type of gypsum board.

2. Typical exterior gypsum board installation, showing corner details, panel joint details, and the like.
3. Typical shaft wall assembly.
4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.

D. Samples:

1. Corner bead.
2. Edge trim.
3. Control joints.

E. Test Results:

1. Fire rating test, each fire rating required for each assembly.

### **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

### **1.6 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE**

In accordance with the requirements of ASTM C840.

### **1.7 ENVIRONMENTAL CONDITIONS**

In accordance with the requirements of ASTM C840.

### **1.8 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American 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
- C1177-08 .....Glass Mat Gypsum Substrate for Use as Sheathing
- C1178-11 .....Coated Glass Mat Water-Resistant Gypsum Backing Panel
- C1396-06 .....Gypsum Board
- C1658-06 .....Glass Mat Gypsum Panels
- E84-08.....Surface Burning Characteristics of Building Materials
- E119 – 12.....Fire Tests of Building Construction and 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 PERFORMANCE REQUIREMENTS**

- A. Fire-Resistance – Rated Assemblies:
  - 1. For fire-resistant-rated assemblies, provide materials and construction identical to those tested in assemblies indicated according to ASTM E119 by an Independent Testing Agency.

### **2.2 GYPSUM BOARD**

- A. Gypsum Board: ASTM C1396, Type X, 16 mm (5/8 inch) thick unless shown otherwise.
- B. Coreboard or Shaft Wall Liner Panels.
  - 1. ASTM C1396, Type X.
  - 2. ASTM C1658: Glass Mat Gypsum Panels,
  - 3. Coreboard for shaft walls 300, 400, 600 mm (12, 16, or 24 inches) wide by required lengths 25 mm (one inch) thick with paper faces treated to resist moisture.
- C. Water Resistant Gypsum Backing Board: ASTM C1178, Type X, 16 mm (5/8 inch) thick.
- 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.

## **2.3 GYPSUM SHEATHING BOARD**

- A. ASTM C1177, Type X, glass-mat water-resistant core, 16 mm (5/8 inch) thick.
  - 1. Primed surface compatible with roof membrane and roof membrane adhesive at roof locations.

## **2.4 ACCESSORIES**

- A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet.
- B. Flanges not less than 22 mm (7/8 inch) wide with punch-outs 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.

## **2.7 SHEATHING JOINT-AND-PENETRATION MATERIALS**

- A. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass fiber tape, of type recommended by sheathing and tape manufacturer.

## **2.8 TEXTURE FINISHES**

- A. Primer: As recommended by textured finish manufacturer.
- B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.
  - 1. Texture: Extra fine Orange Peel.

## **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. Comply with ASTM C1178 at locations to receive ceramic tile wall finish.
- D. Use gypsum boards in maximum practical lengths to minimize number of end joints.
- E. Bring gypsum board into contact, but do not force into place.
- F. Ceilings:
  - 1. For single-ply construction, use perpendicular application.
  - 2. For two-ply assemblies:
    - a. Use perpendicular application.
    - b. Apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.
- G. Walls (Except Shaft Walls):
  - 1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
  - 2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
  - 3. Stagger screws on abutting edges or ends.
  - 4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.

5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
6. For three-ply gypsum board assemblies, apply plies in same manner as for two-ply assemblies, except that heads of fasteners need only be driven flush with surface for first and second plies. Apply third ply of wallboard in same manner as second ply of two-ply assembly, except use fasteners of sufficient length enough to have the same penetration into framing members as required for two-ply assemblies.
7. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
8. Control Joints ASTM C840 and as follows:
  - a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
  - b. Not required for wall lengths less than 9000 mm (30 feet).
  - c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.

H. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:

1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes.

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 C1177 and 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.
- F. Install sheathing joint-and-penetration materials per manufacturer's written installation instructions.
  - 1. Apply self-adhering glass fiber sheathing tape to glass-mat sheathing board joints and exposed fasteners.
  - 2. Seal other penetrations and openings (windows, etc...) using products recommended by joint-and-penetration material manufacturer for the condition encountered.

### **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 (non-bearing for two-hour fire rating.)
- 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.

F. Elevator Shafts:

1. Conform to UL Design No. U438 (Non-Load-Bearing for 2-hour rating), unless noted otherwise.
2. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
2. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

### **3.5 FINISHING OF GYPSUM BOARD**

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for all finished areas open to public view. Level 1 finish for ceiling plenum areas, concealed areas, and where indicated. Level 2 finish for panels that are substrate for tile.
- 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.
  3. Primer has been installed.
- C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of non decorated smoke barrier, fire rated, and sound rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining

openings and maintain the integrity of the smoke barrier, fire rated, and sound rated construction. Sanding is not required of non decorated surfaces.

- D. Texture Finish Application: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Mix and apply using powered spray equipment, to product a uniform texture matching approved mock-pup and free of starved spots of other evidence of thin application or of application patterns.
- E. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

### **3.6 REPAIRS**

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including non-decorated 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.
- E. Remove and replace panels that are wet, moisture damages, and mold damaged.

- - - E N D - - -

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies ceramic and porcelain, marble thresholds, metal divider strips, waterproofing membranes for thin-set applications, crack isolation membranes, 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.
- E. Simulated Stone Window Sills: Section 12 36 61, SIMULATED STONE COUNTERTOPS

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



7. Reinforcing tape.
8. Leveling compound.
9. Latex-Portland cement mortar and grout.
10. Commercial Portland cement grout.
11. Organic adhesive.
12. Slip resistant tile.
13. Waterproofing isolation membrane.
14. Fasteners.

D. Certification:

1. Master grade, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
  - a. Chemical resistant mortar and grout (epoxy and furan).
  - b. Modified epoxy emulsion.
  - c. Commercial Portland cement grout.
  - d. Cementitious backer unit.
  - e. Dry-set Portland cement mortar and grout.
  - f. Elastomeric membrane and bond coat.
  - g. Reinforcing tape.
  - h. Latex-Portland cement mortar and grout.
  - i. Leveling compound.
  - j. Organic adhesive.
  - k. Waterproof isolation membrane.
  - l. Factory mounted tile suitability for application in wet area specified under 2.1, A, 3 with list of successful in-service performance locations.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.5 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.

## **1.6 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
  - 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   |
| A118.7-09 .....                                       | High Performance Cement Grouts for Tile Installation.  |
| A118.9-05 .....                                       | Cementitious Backer Units  |
| A118.12.....  | Crack Isolation Membrane for Thin-Set Ceramic Tile.  |
| A136.1-05 .....                                       | Organic Adhesives for Installation of Ceramic Tile   |
| A137.1-88 .....                                       | Ceramic Tile   |
| C. American Society For Testing And Materials (ASTM): |  |
| 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  |
| C948-81 .....   | Dry and Wet Bulk Density Water Absorption, and Apparent Porosity of Thin Section of Glass-Fiber Reinforced Concrete                                    |
| 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                 |
| C1178/C1178M-06 .....                                 | Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel   |
| C1325-08b .....                                       | Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units  |

D. Marble Institute of America (MIA): Design Manual III-2007

E. Tile Council of America, Inc. (TCA):

2007 .....Handbook for Ceramic Tile Installation

## **1.7 EXTRA MATERIALS**

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Coordinate delivery to location for storage with the Resident Engineer.

## **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 and Storage including Refrigerated Rooms

c. Class IV, 6000 revolutions for remaining areas.

3. Slip Resistant Tile for Floors:

a. Coefficient of friction, when tested in accordance with ASTM C1028, required for level of performance:

1) Not less than 0.7 (wet condition) for bathing areas.

2) Not less than 0.8 on ramps for wet and dry conditions.

3) Not less than 0.6, except 0.8 on ramps as stated above, for wet and dry conditions for other areas.

b. Tile Having Abrasive Grains: Unglazed Ceramic Mosaic Tile: Abrasive grains throughout body of the tile.

c. Porcelain Paver Tile: Matte surface finish.

4. Mosaic tile may be mounted or joined together by a resinous bonding material along tile edges.

5. Do not use back-mounted tiles unless certified by manufacturer as noted in paragraph 1.3.D.

6. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

7. Factory-Applied Temporary Protective Coating:
  - a. Protect exposed face surfaces (top surface) of tile against adherence of mortar and grout by pre-coating with a continuous film of petroleum paraffin wax, applied hot.
  - b. Do not coat unexposed tile surfaces.
  - c. Pre-wax tiles set or grouted with furan or epoxy or latex modified mortars.
- B. Unglazed Ceramic Mosaic 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. Porcelain Paver Tile: Nominal 8 mm (5/16 inch) thick, with cushion edges. Porcelain tile produced by the dust pressed method shall be made of approximately 50% feldspar; the remaining 50% shall be made up of various high-quality light firing ball clays yielding a tile with a water absorption rate of 0.5% or less and a breaking strength of between 390 to 400 pounds.
- E. Trim Shapes:
  1. Conform to applicable requirements of adjoining floor and wall tile.
  2. Use trim shapes sizes conforming to size of adjoining field wall tile including existing spaces unless detailed or specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
  3. Internal and External Corners:
    - a. Square internal and external corner joints are not acceptable.
    - b. External corners including edges: Use bullnose shapes.
    - c. Internal corners: Use cove shapes.
    - d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.
    - e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.
    - f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.
    - g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.
    - 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 showers or wet areas.
- B. 1/2-inch (12.7mm) thickness
- C. ANSI A118.9 or ASTM C1325
- D. Use Cementitious backer units in maximum available lengths.
- E. 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**

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

## **2.6 SETTING MATERIALS OR BOND COATS**

- A. Conform to TCA Handbook for Ceramic Tile Installation.
- B. Portland Cement Mortar: ANSI A108.1.
- C. Latex-Portland Cement Mortar: ANSI A118.4.
  - 1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A118.4.

2. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of Portland cement; dry, re-dispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
- D. Dry-Set Portland Cement Mortar: ANSI A118.1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A118.4.
- E. Organic Adhesives: ANSI A136.1, Type 1.
- F. Chemical-Resistant Bond Coat:
  1. Epoxy Resin Type: ANSI A118.3.
  2. Furan Resin Type: ANSI A118.5.

## **2.7 GROUTING MATERIALS**

- A. Coloring Pigments:
  1. Pure mineral pigments, lime-proof and non-fading, complying with ASTM C979.
  2. Add coloring pigments to grout by the manufacturer.
  3. Job colored grout is not acceptable.
  4. Use is required in Commercial Portland Cement Grout, Dry-Set Grout, and Latex-Portland Cement Grout.
- B. White Portland Cement Grout:
  1. ANSI A118.6.
  2. Use one part white Portland cement to one part white sand passing a number 30 screen.
  3. Color additive not permitted.
- C. Commercial Portland Cement Grout: ANSI A118.6 color as specified.
- D. Dry-Set Grout: ANSI A118.6 color as specified.
- E. Latex-Portland Cement Grout: ANSI A118.6 color as specified.
  1. Un-sanded grout mixture for joints 3.2 mm (1/8 inch) and narrower.
  2. Sanded grout mixture for joints 3.2 mm (1/8 inch) and wider.
- F. Chemical-Resistant Grout:
  1. Epoxy grout, ANSI A118.3.
  2. Furan grout, ANSI A118.5.

## **2.8 PATCHING AND LEVELING COMPOUND**

- A. Portland cement base, polymer-modified, self-leveling compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- B. Shall have minimum following physical properties:
  1. Compressive strength - 25 MPa (3500 psig) per ASTM C109/C109M.
  2. Flexural strength - 7 MPa (1000 psig) per ASTM C348 (28 day value).

3. Tensile strength - 600 psi per ANSI 118.7.
4. Density – 1.9.
- C. Capable of being applied in layers up to 38 mm (1-1/2 inches) thick without fillers and up to 100 mm (four inches) thick with fillers, being brought to a feather edge, and being towed to a smooth finish.
- D. Primers, fillers, and reinforcement as required by manufacturer for application and substrate condition.
- E. Ready for use in 48 hours after application.

## **2.9 MARBLE**

- A. Soundness Classification in accordance with MIA Design Manual III Groups.
- B. Thresholds:
  1. Group A, Minimum abrasive hardness (Ha) of 10.0 per ASTM C241.
  2. Honed finish on exposed faces.
  3. Fabricate from one piece without holes, cracks, or open seams; full depth of wall or frame opening by full width of wall or frame opening; 19 mm (3/4-inch) minimum thickness and 6 mm (1/4-inch) minimum thickness at beveled edge.
  4. Set not more than 13 mm (1/2-inch) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2. On existing floor slabs provide 13 mm (1/2-inch) above ceramic tile surface with bevel edge joint top flush with adjacent floor.
  5. One piece full width of door opening. Notch thresholds to match profile of door jambs.
- C. Window Stools: See Specification Section 12 36 61, SIMULATED STONE COUNTERTOPS.

## **2.10 METAL DIVIDER STRIPS**

- A. Terrazzo type divider strips.
- B. Heavy top type strip with 5 mm (3/16 inch) wide top and 38 mm (1-1/2 inch) long leg.
- C. Embedded leg perforated and deformed for keying to mortar.
- D. Aluminum or stainless steel exposed edge material finish.

## **2.11 WATER**

Clean, potable and free from salts and other injurious elements to mortar and grout materials.

## **2.12 CLEANING COMPOUNDS**

- A. Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- B. Materials containing acid or caustic material not acceptable.



## **2.13 CRACK ISOLATION MEMBRANE.**

General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated.

## **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 or Masonry:
  - 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.
    - 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. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.
- E. Existing Floors and Walls:
1. Remove existing composition floor finishes and adhesive. Prepare surface by grinding, chipping, self-contained power blast cleaning or other suitable mechanical methods to completely expose uncontaminated concrete or masonry surfaces. Follow safety requirements of ANSI A10.20.
  2. Remove existing concrete fill or topping to structural slab. Clean and level the substrate for new setting bed.
  3. Where new tile bases are required to finish flush with plaster above or where they are extensions of similar bases in conjunction with existing floor tiles cut channel in floor slab and expose rough wall construction sufficiently to accommodate new tile base and setting material.

### **3.4 CEMENTITIOUS BACKER UNITS**

- A. Remove polyethylene wrapping from cementitious backer units and separate to allow for air circulation. Allow moisture content of backer units to dry down to a maximum of 35 percent before applying joint treatment and tile.

- B. Install in accordance with ANSI A108.11 except as specified otherwise.
- C. Install units horizontally or vertically to minimize joints with end joints over framing members.  
Units with rounded edges; face rounded edge away from studs to form a V joint for joint treatment.
- D. Secure cementitious backer units to each framing member with screws spaced not more than 200 mm (eight inches) on center and not closer than 13 mm (1/2 inch) from the edge of the backer unit or as recommended by backer unit manufacturer. Install screws so that the screw heads are flush with the surface of the backer unit.
- E. Do not install joint treatment for seven days after installation of cementitious backer unit.
- F. 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 sinks or other plumbing receptors.

### **3.5 GLASS MAT WATER-RESISTANT GYPSUM BACKER BOARD**

- A. Install in accordance with manufacturer's instructions. TCA Systems W245-01.
- B. Treat joints with tape and latex-Portland cement mortar or adhesive.

### **3.6 MARBLE**

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

### **3.7 METAL DIVIDER STRIPS**

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

2. Set tile up against the joint ensuring that the top edge of the joint is flush or slightly below the top of the tile.

### **3.8 CRACK ISOLATION MEMBRANE**

Install membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

### **3.9 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. Setting Beds or Bond Coats:
  1. Set wall tile installed over concrete backer board in latex-Portland cement mortar, ANSI A108.1B.
  2. Set tile installed over gypsum board in organic adhesive, ANSI A108.4, TCA System W242-02.
  3. 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. Align new tile work scheduled for existing spaces to the existing tile work unless specified otherwise.
  2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise.
  3. Form intersections and returns accurately.
  4. Cut and drill tile neatly without marring surface.
  5. Cut edges of tile abutting penetrations, finish, or built-in items:
    - a. Fit tile closely around electrical outlets, piping, fixtures and fittings, so that plates, escutcheons, collars and flanges will overlap cut edge of tile.
    - b. Seal tile joints water tight as specified in Section 07 92 00, JOINT SEALANTS, around electrical outlets, piping fixtures and fittings before cover plates and escutcheons are set in place.
  6. Completed work shall be free from hollow sounding areas and loose, cracked or defective tile.
  7. Remove and reset tiles that are out of plane or misaligned.
  8. Floors:

- a. Extend floor tile beneath casework and equipment, except those units mounted in wall recesses.
  - b. Align finish surface of new tile work flush with other and existing adjoining floor finish where shown.
  - c. Shove and vibrate tiles over 200 mm (8 inches) square to achieve full support of bond coat.
9. Walls:
- a. Cover walls and partitions, including pilasters, furred areas, and freestanding columns from floor to ceiling, or from floor to nominal wainscot heights shown with tile.
  - b. Finish reveals of openings with tile, except where other finish materials are shown or specified.
  - c. At window openings, provide tile stools and reveals, except where other finish materials are shown or specified.
  - d. Finish wall surfaces behind and at sides of casework and equipment, except those units mounted in wall recesses, with same tile as scheduled for room proper.
10. Joints:
- a. Keep all joints in line, straight, level, perpendicular and of even width unless shown otherwise.
  - b. Make joints 2 mm (1/16 inch) wide for glazed wall tile and mosaic tile work.
  - c. Make joints in Paver tile, porcelain type; maximum 3 mm (1/8 inch) wide.
11. Back Buttering: For installations indicated below, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
- a. Tile installed with chemical-resistant mortars and grouts.
  - b. Tile wall installations composed of tiles 200 by 200 mm (8 by 8 inches or larger).

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

- A. Mortar Mixes for Floor, Wall And Base Tile: ANSI A108.1, except specified otherwise.
- B. Installing Wall and Base Tile: ANSI A108.1, except specified otherwise.
- C. Installing Floor Tile: ANSI A108.1, except as specified otherwise.

### **3.11 PORCELAIN TILE INSTALLED WITH LATEX PORTLAND CEMENT BONDING MORTAR**

Due to the denseness of porcelain tile use latex Portland cement bonding mortar that meets the requirements of ANSI A118.4. Bonding mortars shall be mixed in accordance with manufacturer's

instructions. Improper liquid ratios and dwell time before placement of bonding mortar and tile shall affect bond.

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

Installation of Tile: ANSI A108.5, except as specified otherwise.

### **3.13 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH ORGANIC ADHESIVE**

Installation of Tile: ANSI A108.4.

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

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

### **3.15 GROUTING**

- A. Grout Type and Location:
  - 1. Grout for glazed wall and base tile, paver tile and unglazed mosaic tile Portland cement grout, latex-Portland cement grout, dry-set grout, or commercial Portland cement grout.
- B. Workmanship:
  - 1. Install and cure grout in accordance with the applicable standard.
  - 2. Portland Cement grout: ANSI A108.10.
  - 3. Epoxy Grout: ANSI A108.6.
  - 4. Furan and Commercial Portland Cement Grout: ANSI A108.8 and in accordance with the manufacturer's printed instructions.
  - 5. Dry-set grout: ANSI A108.5.

### **3.16 MOVEMENT JOINTS**

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

### **3.17 CLEANING**

- A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.

- B. Methods and materials used shall not damage or impair appearance of tile surfaces.
- C. The use of acid or acid cleaners on glazed tile surfaces is prohibited.
- D. Clean tile grouted with epoxy, furan and commercial Portland cement grout and tile set in elastomeric bond coat as recommended by the manufacturer of the grout and bond coat.

### **3.18 PROTECTION**

- A. Keep traffic off tile floor, until grout and setting material is firmly set and cured.
- B. Where traffic occurs over tile floor, cover tile floor with not less than 9 mm (3/8 inch) thick plywood, wood particle board, or hardboard securely taped in place. Do not remove protective cover until time for final inspection. Clean tile of any tape, adhesive and stains.

### **3.19 TESTING FINISH FLOOR**

- A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.

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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. Sprayed-Fire Proofing Material: Section 07 81 00, APPLIED FIREPROOFING.
- B. Color, pattern, and location of each type of acoustical unit: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Access doors: 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.
  - 2. Colored markers for units providing access.
- C. Manufacturer's Literature and Data:
  - 1. Ceiling suspension system, each type, showing complete details of installation, including suspension system specified to match existing.
  - 2. Acoustical units, each type
- D. Manufacturer's Certificates: Acoustical units, each type, in accordance with specification requirements.
- E. Close-Out Data
- F. Maintenance Data

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the



requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.5 DEFINITIONS**

- A. Standard definitions as defined in ASTM C634.
- B. Terminology as defined in ASTM E1264.

## **1.6 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 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI7.
- B. Surface Burning Characteristics: Comply with ASTM E84
  1. Flame Spread Index: Comply with ASTM E1264 for Class A materials.
  2. Smoke Developed Index: 50 or less.

## **2.2 METAL SUSPENSION SYSTEM**

- A. ASTM C635, heavy-duty system, except as otherwise specified.
  - 1. Ceiling suspension system members may be fabricated from either of the following unless specified otherwise.
    - a. Galvanized cold-rolled steel, bonderized.
    - b. Extruded aluminum.
  - 2. Use same construction for cross runners as main runners. Use of lighter-duty sections for cross runners is not acceptable.
- B. Exposed grid suspension system for support of lay-in panels:
  - 1. Exposed grid width not less than 22 mm (7/8 inch) with not less than 8 mm (5/16 inch) panel bearing surface.
  - 2. Fabricate wall molding and other special molding from the same material with same exposed width and finish as the exposed grid members.
  - 3. On exposed metal surfaces apply baked-on enamel flat texture finish in color to match adjacent acoustical units unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

## **2.3 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.

## **2.4 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).

## **2.5 ANCHORS AND INSERTS**

- A. Use anchors or inserts to support twice the loads imposed by hangers attached thereto.
- B. Hanger Inserts:
  - 1. Fabricate inserts from steel, zinc-coated (galvanized after fabrication).

2. Flush ceiling insert type:
  - a. Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
  - b. Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
  - c. Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.

C. Clips:

1. Galvanized steel.
2. Designed to clamp to steel beam or bar joists, or secure framing member together.
3. Designed to rigidly secure framing members together.
4. Designed to sustain twice the loads imposed by hangers or items supported.

## 2.6 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<br>Kg Pound |     | Hot-rolled<br>Kg Pound |      |
|---------|-------------|-------------------------|-----|------------------------|------|
| 38      | 1 1/2       | 215.4                   | 475 | 508                    | 1120 |
| 50      | 2           | 267.6                   | 590 | 571.5                  | 1260 |

## 2.7 ACOUSTICAL UNITS

A. General:

1. Ceiling Panel 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.
3. Class A Flame Spread: ASTM 84
4. Minimum NRC (Noise Reduction Coefficient): 0.55 unless specified otherwise: ASTM C423.
5. Minimum CAC (Ceiling Attenuation Class): 40-44 range unless specified otherwise: ASTM E413.
6. Manufacturers standard finish, minimum Light Reflectance (LR) coefficient of 0.75 on the exposed surfaces, except as specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

7. Lay-in panels: Sizes as shown, with square edges or reveal edges as identified in Section 09 06 00, SCHEDULE FOR FINISHES..
- 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.

## **2.8 ACCESS IDENTIFICATION**

- A. Markers:
  1. Use colored markers with pressure sensitive adhesive on one side.
  2. Make colored markers of paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) in diameter.
- B. Use markers of the same diameter throughout building.
- C. Color Code: Use following color markers for service identification:
 

|             |  |
|-------------|--|
| Color ..... | Service                                  |
| Red .....   | Sprinkler System: Valves and Controls    |
| Green.....  | Domestic Water: Valves and Controls      |
| Yellow..... | Chilled Water and Heating Water          |
| Orange..... | Ductwork: Fire Dampers                   |
| Blue.....   | Ductwork: Dampers and Controls           |
| Black ..... | Gas: Laboratory, Medical, Air and Vacuum |

## **PART 3 - EXECUTION**

### **3.1 CEILING TREATMENT**

- A. Treatment of ceilings shall include sides and soffits of ceiling beams, furred work 600 mm (24 inches) wide and over, and vertical surfaces at changes in ceiling heights unless otherwise shown. Install acoustic panels after wet finishes have been installed and solvents have cured.
- B. Lay out acoustical units symmetrically about center lines of each room or space unless shown otherwise on reflected ceiling plan.
- C. Moldings:
  1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
  2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.
- D. Perimeter Seal:

1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.
2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

E. Existing ceiling:

1. Where extension of existing ceilings occur, match existing.
2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units within a space which results in contrast between old and new acoustic units.
3. Comply with specifications for new acoustical units for new units required to match appearance of existing units.

### **3.2 CEILING SUSPENSION SYSTEM INSTALLATION**

A. General:

1. Install metal suspension system for acoustical 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.
- B. 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.
- C. Indirect Hung Suspension System:
  - 1. As illustrated in ASTM C635.
  - 2. Space carrying channels for indirect hung suspension system not more than 1200 mm (4 feet) on center. Space hangers for carrying channels not more than 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) on center so as to insure that specified requirements are not exceeded.
  - 3. Support main runners by specially designed clips attached to carrying channels.
- D. Seismic Ceiling Bracing System:
  - 1. Construct system in accordance with ASTM E580.
  - 2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner or carrying channels of suspended ceiling at bottom.

### **3.3 ACOUSTICAL UNIT INSTALLATION**

- A. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
- B. Install lay-in acoustic panels in exposed grid with not less than 6 mm (1/4 inch) bearing at edges on supports.
  - 1. Install panel to lay level and in full contact with exposed grid.
  - 2. Replace cracked, broken, stained, dirty, or panels not cut for minimum bearing.
- C. Markers:
  - 1. Install markers of color code specified to identify the various concealed piping, mechanical, and plumbing systems.
  - 2. Attach colored markers to exposed grid on opposite sides of the units providing access.

### **3.4 CLEAN-UP AND COMPLETION**

- A. Replace damaged, discolored, dirty, cracked and broken acoustical units.
- B. Leave finished work free from defects.

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**SECTION 09 65 13**  
**RESILIENT BASE AND ACCESSORIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies the installation of vinyl or rubber base, resilient molding accessories, and resilient stair treads.

**1.2 RELATED WORK**

Metal Safety Nosing for Exterior Stairs: Section 05 50 00, METAL FABRICATIONS.

B. Color and texture: Section 09 06 00, SCHEDULE FOR FINISHES.

C. Integral base with sheet flooring: Section 09 65 16, RESILIENT SHEET FLOORING.

D. Rubber Tile and Solid Vinyl Composition Tile: Section 09 65 19, RESILIENT TILE FLOORING.

**1.3 SUBMITTALS**

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. 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 and Riser: 150 mm (6 inches) long.
3. Resilient Molding Accessories: 150 mm (6 inches) long, each type and color.
4. Adhesive: Literature indicating each type.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.



1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™  
CERTIFICATION.

**1.5 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.

**1.6 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.

**1.7 APPLICABLE PUBLICATIONS**

- A. The publication listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):  
F1861-08.....Resilient Wall Base
- C. Federal Specifications (Fed. Spec.):  
RR-T-650E.....Treads, Metallic and Non-Metallic, Nonskid

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Use only products by the same manufacturer and from the same production run.
- B. Refer to Finish Schedule on the Drawings for locations.

**2.2 RESILIENT BASE**

- A. ASTM F1861, 3.2 mm (1/8 inch) thick, 100 mm (4 inches) high, Type TP Thermoplastics, Group 2-layered. Style B-cove.
- B. Where carpet occurs, use Style A-straight.
- C. Use only one type of base throughout.

**2.3 RESILIENT TREADS AND RISERS**

- 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.
- C. Provide 3.2 mm (1/8-inch) thick, smooth, flat, coved-toe risers of height required and length to match stair tread, produced by the same manufacturer as the treads and recommended by manufacturer for installation with treads. Color to match treads.

## **2.4 RESILIENT MOLDING ACCESSORY**

- A. Carpet edge for glue-down applications and reducer strip for resilient floor covering.
- B. Material: Rubber.
- C. Profile and Dimensions: As selected from the Manufacturer's full range.

## **2.5 PRIMER (FOR CONCRETE FLOORS)**

As recommended by the adhesive and tile manufacturer.

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

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

## **2.7 ADHESIVES**

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

# **PART 3 - EXECUTION**

## **3.1 PROJECT CONDITIONS**

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

## **3.2 INSTALLATION REQUIREMENTS**

- A. The respective manufacturer's instructions for application and installation will be considered for use when approved by the Resident Engineer.
- B. Submit proposed installation deviation from this specification to the Resident Engineer indicating the differences in the method of installation.
- C. The Resident Engineer reserves the right to have test portions of material installation removed to check for non-uniform adhesion and spotty adhesive coverage.

## **3.3 PREPARATION**

- A. Examine surfaces on which material is to be installed.
- B. Fill cracks, pits, and dents with leveling compound.
- C. Level to 3.2 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 AND RISER INSTALLATION**

A. Prepare surfaces to receive the treads and risers in accordance with applicable portions of paragraph, preparation.

B. Layout of Treads and Risers.

1. No joints will be accepted in treads or risers.
2. Set full treads and risers on intermediate and floor landings.

C. Application:

1. Apply adhesive uniformly with no bare spots.
2. Roll and pound treads and risers to assure adhesion.

### **3.6 RESILIENT MOLDING ACCESSORY INSTALLATION.**

A. Comply with manufacturer's written instructions for installation of resilient accessories.

- B. Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet that would otherwise be exposed.

### **3.7 CLEANING AND PROTECTION**

- A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets.
- B. Keep traffic off resilient material for at least 72 hours after installation.
- C. Clean and polish materials in the following order:
  - 1. After two weeks, scrub resilient base, treads/riser, and molding 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/riser and molding rubber materials.
- D. When construction traffic is anticipated, cover tread materials with reinforced kraft paper and plywood or hardboard properly secured and maintained until removal is directed by the Resident Engineer.
- E. Where protective materials are removed and immediately prior to acceptance, replace damaged materials and re-clean resilient materials. Damaged materials are defined as having cuts, gouges, scrapes or tears and not fully adhered.

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**SECTION 09 65 19**  
**RESILIENT TILE FLOORING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

- A. Color and pattern and location in room finish schedule: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- C. 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. 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. Plank: 75mm by 200 mm (3 inches by 12 inches) for each type, pattern and color.
  - 3. Edge Strips: 150 mm (6 inches) long, each type.
- D. Shop Drawings:
  - 1. Layout of patterns shown on the drawings and in Section 09 06 00, SCHEDULE FOR FINISHES.
  - 2. Edge strip locations showing types and detail cross sections.
- E. Test Reports:
  - 1. Abrasion resistance: Depth of wear for each tile type and color and volume loss of tile, certified by independent laboratory.
  - 2. Tested per ASTM F510.
- F. Maintenance Data.

#### **1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

- 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

#### **1.5 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.

#### **1.6 STORAGE**

- A. Store materials in weathertight and dry storage facility.
- B. Protect from damage from handling, water, and temperature.

#### **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):
  - D4078-02 (2008)..... Water Emulsion Floor Finish
  - E648-10.....Critical Radiant Flux of Floor Covering Systems Using a  
Radiant Energy Source
  - E662-09.....Specific Optical Density of Smoke Generated by Solid Materials
  - E1155-96 (R2008) .....Determining Floor Flatness and Floor Levelness Numbers
  - F510-93 (R 2008).....Resistance to Abrasion of Resilient Floor Coverings Using an  
Abrader with a Grit Feed Method

F710-08.....Preparing Concrete Floors to Receive Resilient Flooring

F1066-04 (R2010)..... Vinyl Composition Floor Tile

F1344-10.....Rubber Floor Tile

F1700-04 (R2010).....Solid Vinyl Floor Tile

C. Resilient Floor Covering Institute (RFCI):

IP #2.....Installation Practice for Vinyl Composition Tile (VCT)

D. Federal Specifications (Fed. Spec.):

SS-T-312.....Tile Floor: Asphalt, Rubber, Vinyl and Vinyl Composition

## **1.8 EXTRA MATERIALS**

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 33 boxes or fraction thereof, (but not less than 3 percent of the amount installed) of each type, color, and pattern of floor tile installed.
2. Coordinate delivery to location for storage with the Resident Engineer.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Furnish product type, materials of the same production run and meeting following criteria.
- B. Use adhesives, underlayment, primers and polish recommended by the floor resilient material manufacturer.
- C. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E 648.
- D. Smoke density: Less than 450 per ASTM E662.

### **2.2 VINYL COMPOSITION TILE**

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

### **2.3 SOLID VINYL-TILE**

- A. ASTM F1700, Class III (printed film), Types A and B, 76mm by 915 mm (3 by 12 inches) , 114 mm by 915 mm (4-1/2 inches by 12 inches) and 152mm by 915 mm (6 inches by 12 inches), 2.5 mm (3/32 inch) thick, beveled edge, tick finish.

### **2.4 RUBBER TILE**

- A. ASTM F1344, Class 1, homogenous rubber tile, B, through mottled, 300 mm (12 inches) square, 3 mm (1/8 inch) thick.
- B. Use for stair landings where resilient stair treads/risers are installed.
- C. Color and pattern uniformly distributed throughout tile.
- D. Molded pattern wearing surface base thickness 3 mm (1/8 inch) thick.

- E. Where rubber tile is used provide tiles with a minimum of 90% post consumer rubber.

## **2.5 ADHESIVES**

- A. Comply with applicable regulations regarding toxic and hazardous materials Green Seal (GS-36) for commercial adhesive.
- B. Use low-VOC adhesive during installation. Water based is preferred over solvent based adhesives.

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

As recommended by the adhesive and tile manufacturer.

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

- A. Provide cementitious products with latex or polyvinyl acetate resins in the mix.
- B. Determine the type of underlayment selected for use by the condition to be corrected.

## **2.8 POLISH AND CLEANERS**

- A. Cleaners RFCI CL-1.
- B. Polish: ASTM D4078 Protective, liquid floor-polish products recommended by Floor Tile Manufacturer.

## **2.9 EDGE STRIPS**

- A. 28 mm (1-1/8 inch) wide unless shown otherwise.
- B. Bevel from maximum thickness to minimum thickness for flush joint unless shown otherwise.
- C. Extruded aluminum, mill finish, mechanically cleaned:
  - 1. Drill and counter sink edge strip for flat head screws.
  - 2. Space holes near ends and approximately 225 mm (9 inches) on center between.
- D. Resilient Edge Strip or Reducer Strip: Fed. Specs. SS-T-312, Solid vinyl.

## **2.10 SCREWS**

Stainless steel flat head screw.

# **PART 3 - EXECUTION**

## **3.1 PROJECT CONDITIONS**

- A. Maintain temperature of materials a minimum of 22 °C (70 °F,) for 48 hours before installation.
- B. Maintain temperature of rooms where work occurs between 21 °C and 27 °C (70 °F and 80 °F), for at least 48 hours, before, during and after installation.
- C. Do not install flooring until building is permanently enclosed and wet construction in or near areas to receive tile materials is complete, dry and cured.



### **3.2 SUBFLOOR PREPARATION**

- A. Verify that concrete slabs comply with ASTM F710. At existing slabs, determine levelness by F-number method in accordance with ASTM E1155. Overall value shall not exceed as follows:  
FF30/FL20
- B. Correct conditions which will impair proper installation.
- C. Fill cracks, joints and other irregularities in concrete with leveling compound:
  - 1. Do not use adhesive for filling or leveling purposes.
  - 2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
  - 3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joints.
- D. Clean floor of oil, paint, dust, and deleterious substances: Leave floor dry and cured free of residue from existing curing or cleaning agents.
- E. Concrete Subfloor Testing: Determine Adhesion and dryness of the floor by bond and moisture tests as recommended by RFCI manual MRP.
- F. Perform additional subfloor preparation to obtain satisfactory adherence of flooring if subfloor test patches allows easy removal of tile.
- G. Prime the concrete subfloor if the primer will seal slab conditions that would inhibit bonding, or if priming is recommended by the tile or adhesive manufacturers.
- H. Preparation of existing installation shall include the removal of existing resilient floor and existing adhesive. Do not use solvents to remove adhesives.

### **3.3 INSTALLATION**

- A. Install in accordance with manufacturer's instructions for application and installation unless specified otherwise.
- B. Mix tile from at least two containers. An apparent line either of shades or pattern variance will not be accepted.
- C. Tile Layout:
  - 1. If layout is not shown on drawings, lay tile symmetrically about center of room or space with joints aligned.
  - 2. No tile shall be less than 150 mm (6 inches) and of equal width at walls, with the exception of the solid vinyl-tile planks.
  - 3. Place tile pattern in the same direction; do not alternate tiles.
- D. Trim tiles to touch for the length of intersections at pipes and vertical projections, seal joints at pipes with waterproof cement.
- E. Application:

1. Apply adhesive uniformly with no bare spots.
    - a. Conform to RFC1-TM-6 for joint tightness and for corner intersection unless layout pattern shows random corner intersection.
    - b. More than 5 percent of the joints not touching will not be accepted.
  2. Roll tile floor with a minimum 45 kg (100 pound) roller. No exceptions.
  3. The Resident Engineer may have test tiles removed to check for non-uniform adhesion, spotty adhesive coverage, and ease of removal. Install new tile for broken removed tile.
- F. Installation of Edge Strips:
1. Locate edge strips under center line of doors unless otherwise shown.
  2. Set resilient edge strips in adhesive. Anchor metal edge strips with anchors and screws specified.
  3. Where tile edge is exposed, butt edge strip to touch along tile edge.
  4. Where thin set ceramic tile abuts resilient tile, set edge strip against floor file and against the ceramic tile edge.

### **3.4 CLEANING AND PROTECTION**

- A. Comply with Manufacturer's Written Instructions for cleaning and protecting tile.
- B. Clean adhesive marks on exposed surfaces during the application of resilient materials before the adhesive sets. Exposed adhesive is not acceptable.
- C. Keep traffic off resilient material for a minimum 72 hours after installation.
- D. 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.
  4. Do not polish rubber tile flooring, unless specifically permitted, in writing, by the Rubber Tile Manufacturer.
- E. When construction traffic occurs over tile, cover resilient materials with reinforced kraft paper properly secured and maintained until removal is directed by Resident Engineer. At entrances and where wheeled vehicles or carts are used, cover tile with plywood, hardboard, or particle board over paper, secured and maintained until removal is directed by Resident Engineer.
- F. 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. Damaged material are defined as having cuts, gouges, scrapes, or tears and are not fully adhered.

### **3.6 LOCATION**

- A. Unless otherwise specified or shown, install tile flooring, on floor under areas where casework, laboratory and pharmacy furniture and other equipment occurs, except where mounted in wall recesses.
- B. Extend tile flooring for room into adjacent closets and alcoves.

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**SECTION 09 68 00**  
**CARPETING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

Section specifies modular carpet tile, edge strips, adhesives, and other items required for complete installation.

**1.2 RELATED WORK**

- A. Color and texture of carpet and edge strip: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Resilient wall base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

**1.3 QUALITY ASSURANCE**

- A. Carpet installed by mechanics certified by the Floor Covering Installation Board.
- B. Certify and label the carpet that it has been tested and meets criteria of CRI IAQ Carpet Testing Program for indoor air quality.
- C. Pre-Installation Conference: Conduct conference at the Project Site.

**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 600 x 600 mm (24 x 24 inches) of carpets, showing quality, pattern and color specified in Section 09 06 00, SCHEDULE FOR FINISHES.  
Provide a minimum of three (3) samples of each color, texture, and type of carpet identified.
  - 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 carpet module. Show installation pattern, pattern type, location, and direction. Show pile direction.

- E. Maintenance Data: Carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods and cleaning cycles.
- F. Sample Warranty

### **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

- 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

### **1.6 DELIVERY AND STORAGE**

- A. Comply with CRI 104.
- B. Deliver carpet in manufacturer's original wrappings and packages clearly labeled with manufacturer's name, brand, name, size, dye lot number and related information.
- C. Deliver adhesives in containers clearly labeled with manufacturer's name, brand name, number, installation instructions, safety instructions and flash points.
- D. 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.

### **1.7 ENVIRONMENTAL REQUIREMENTS**

Comply with CRI 104 for temperature, humidity and ventilation limitations. 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.

### **1.8 WARRANTY**

Carpet and installation subject to terms of "Warranty of Construction" of the General Conditions, except that warranty period is extended to two years (minimum).

## 1.9 APPLICABLE PUBLICATIONS

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

B. American National Standards Institute (ANSI):

ANSI/NSF 140-10 .....Sustainable Carpet Assessment Standard

C. American Association of Textile Chemists and Colorists (AATCC):

AATCC 16-04.....Colorfastness to Light

AATCC 129-10.....Colorfastness to Ozone in the Atmosphere under High  
Humidities

AATCC 134-11.....Electric Static Propensity of Carpets

AATCC 165-08.....Colorfastness to Crocking: Textile Floor Conerings-AATCC  
Crockmeter Method

AATCC 174-11.....Antimicrobial Activity Assessment of New Carpets.

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

ASTM D1335-05 .....Tuft Bind of Pile Yarn Floor Coverings

ASTM D3278-96 (R2004).....Flash Point of Liquids by Small Scale Closed-Cup Apparatus

ASTM D5116-10 .....Determinations of Organic Emissions from Indoor  
Materials/Products

ASTM D5252-05 .....Operation of the Hexapod Tumble Drum Tester

ASTM D5417-05 .....Operation of the Vettermann Drum Tester

ASTM E648-10.....Critical Radiant Flux of Floor-Covering Systems Using a  
Radiant Heat Energy Source

ASTM F710-11 .....Standard Practice for Preparing Concrete Floors to Receive  
Resilient Flooring.

E. The Carpet and Rug Institute (CRI):

CRI 104-11 .....Installation of Commercial Carpet

## 1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Furnish 1 box for every 33 boxes or fraction thereof, (but not less than 3 percent of the amount installed) of each type, color, and pattern of carpet tile installed.
2. Coordinate delivery to location for storage with the Resident Engineer.

## **PART 2 - PRODUCTS**

### **2.1 CARPET**

#### **A. Physical Characteristics:**

1. Carpet free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains and other physical and manufacturing defects.
2. Manufacturers standard construction commercial carpet:
  - a. Modular Tile: 660 mm (24 inches) square tile.
3. Provide static control to permanently control static build upto less than 2.0 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC 134.
4. Pile Height: Maximum 3.25 mm (0.10 inch).
5. Pile Fiber: Nylon with recycled content 25 percent minimum branded (federally registered trademark).
6. Pile Type: Level Loop, and cut pile.
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. Color Fastness to Light: Comply with AATCC 16-04, Option E, not less than 4 after 60 AFU (AATCC Fading Units).
13. Delamination Strength: Minimum of 440 N/m (2.5 lb/inch) between secondary backing.
14. Flammability and Critical Radiant Flux Requirements:
  - a. Test Carpet in accordance with ASTM E 648.
  - b. Class I: Not less than 0.45 watts per square centimeter.
  - c. Class II: Not less than 0.22 watts per square centimeter.
  - d. Carpet in corridors, exits and Medical Facilities: Class I.

15. Density: Average Pile Yarn Density (APYD):
  - a. Corridors, lobbies, entrances, common areas or multipurpose rooms, open offices, waiting areas and dining areas: Minimum APYD 6000.
  - b. Other areas: Minimum APYD 4000.
16. VOC Limits: Use carpet and carpet adhesive that comply with the following limits for VOC content when tested according to ASTM D 5116:
  - a. Carpet, Total VOCs: 0.5 mg/sq.m x hr.
  - b. Carpet, 4-PC (4-Phenylcyclohexene): 0.05 mg/sq.m x hr.
  - c. Carpet, Formaldehyde: 0.05 mg/sq.m x hr.
  - d. Carpet, Styrene: 0.4 mg/sq.m x hr.
  - e. Adhesive, Total VOCs: 10.00 mg/sq.m x hr.
  - f. Adhesive, Formaldehyde: 0.05 mg/sq.m x hr.
  - g. Adhesive, 2-Ethyl-1-Hexanol: 3.00 mg/sq.m x hr.
17. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174,
- 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, mildew-resistant, non-staining, 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. Pressure-sensitive type to suit products and sub-floor conditions indicated that is recommended by carpet tile manufacturer for releasable installation.

## **2.3 EDGE STRIPS (MOLDING)**

- A. Rubber Edge Strip:
  1. Beveled floor flange minimum 50 mm (2 inches) wide.
  2. Beveled surface to finish flush with carpet for tight joint and other side to floor finish.
  3. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

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

- A. Provide Portland cement based 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.



- C. Provide formulation recommended by carpet tile manufacturer.

## **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. Do not install carpet until unsatisfactory conditions have been corrected.
- 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 7.10 and per ASTM F710.

### **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. Comply with section 7.3 and with carpet tile manufacturer's written installation instruction for preparing substrates indicated to receive carpet tile installation.
  - 2. Comply with indoor air quality recommendations noted in Section 7.12.
  - 3. Maintain temperature in accordance with Section 7.12.
- 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. Extend carpet tile into toe spaces, door reveals, closets, open-bottom obstructions, removable flanges, alcoves, and similar openings.
- G. Carpet Modules:
  - 1. Install per CRI 104, Section 14, Adhesive Application and per carpet tile manufacturer's written installation instructions.

2. Lay carpet modules with pile in same direction unless specified other wise in Section 09 06 00, SCHEDULE FOR FINISHES.
3. Install carpet modules so that cleaning methods and solutions do not cause dislocation of modules.
4. Lay carpet modules uniformly to provide tight flush joints free from movement when subject to traffic.
5. Maintain dye lot integrity. Do not mix dye lots in same area.

### **3.3 EDGE STRIPS INSTALLATION**

- A. Install edge strips over exposed carpet edges adjacent to uncarpeted finish flooring.
- B. 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 complying with CRI 104, Section 16. Do not use polyethylene film.
- C. Do not permit traffic on carpeted surfaces for at least 48 hours after installation. Protect the carpet in accordance with CRI 104.
- D. Do not move furniture or equipment on unprotected carpeted surfaces.
- E. Just before final acceptance of work, remove protection and vacuum carpet clean.

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**SECTION 09 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. Type of Finish on Sheet Metal Flashing and Trim: Section 07 60 00, FLASHING AND SHEET METAL.
- C. Intumescent Paint: Section 07 81 23, INTUMESCENT FIREPROOFING.
- D. Prefinished flush doors with transparent finishes: Section 08 14 00, WOOD DOORS.
- E. Type of Finish, Color, and Gloss Level of Finish Coat: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Gypsum Board Texture: Section 09 29 00, GYPSUM BOARD.
- G. 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.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.5 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).

## **1.6 MOCK-UP PANEL**

- A. Before starting application of water paint mixtures, apply paint as specified to an area, not to exceed 9 m<sup>2</sup> (100 ft<sup>2</sup>), selected by Resident Engineer.
- B. Finish and texture approved by Resident Engineer will be used as a standard of quality for remainder of work.

## **1.7 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° - 1100F) (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)<br>(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 |

## **1.8 TRAINING OF OWNER'S PERSONNEL**

- A. Painting Contractor shall train the Owner's personnel on the proper methods to touch-up paint on items finished with intumescent paint.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Cementitious Paint (CEP): TT-P-1411A [Paint, Copolymer-Resin, Cementitious (CEP)], Type 1 for exterior use, Type II for interior use.

- B. Wood Sealer: MPI 31 (gloss) or MPI 71 (flat) thinned with thinner recommended by manufacturer at rate of about one part of thinner to four parts of varnish.
- C. 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.
- D. Identity markers options:
  - 1. Pressure sensitive vinyl markers.
  - 2. Snap-on coil plastic markers.
- E. Aluminum Paint (AP): MPI 1.
- F. Interior/Exterior Latex Block Filler: MPI 4.
- G. Exterior Alkyd Wood Primer: MPI 5.
- H. Exterior Oil Wood Primer: MPI 7.
- I. Exterior Alkyd, Flat (EO): MPI 8.
- J. Exterior Alkyd Enamel (EO): MPI 9.
- K. Exterior Latex, Flat (AE): MPI 10.
- L. Exterior Latex, Semi-Gloss (AE): MPI 11.
- M. Organic Zinc rich Coating (HR): MPI 18.
- N. High Heat Resistant Coating (HR): MPI 22.
- O. Cementitious Galvanized Metal Primer: MPI 26.
- P. Exterior/ interior Alkyd Floor Enamel, Gloss (FE): MPI 27.
- Q. Knot Sealer: MPI 36.
- R. Interior Satin Latex: MPI 43.
- S. Interior Low Sheen Latex: MPI 44.
- T. Interior Primer Sealer: MPI 45.
- U. Interior Enamel Undercoat: MPI 46.
- V. Interior Alkyd, Semi-Gloss (AK): MPI 47.
- W. Interior Alkyd, Gloss (AK): MPI 48.
- x. Interior Latex Primer Sealer: MPI 50.
- Y. Interior Alkyd, Eggshell: MPI 51
- Z. Interior Latex, MPI Gloss Level 3 (LE): MPI 52.
- AA. Interior Latex, Flat, MPI Gloss Level 1 (LE): MPI 53.
- BB. Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE): MPI 54.



DD. Interior / Exterior Alkyd Porch & Floor Enamel, Low Gloss (FE): MPI 59.

EE. Interior/ Exterior Latex Porch & Floor Paint, Low Gloss: MPI 60.

FF. Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved) (FC): MPI 66.

GG. Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR): MPI 67.

HH. Interior/ Exterior Latex Porch & Floor Paint, gloss: MPI 68.

II. Epoxy Cold Cured, Gloss (EC): MPI 77.

JJ. Marine Alkyd Metal primer: MPI 79.

KK. Interior Wood Stain, Semi-Transparent (WS): MPI 90.

LL. Wood Filler Paste: MPI 91.

MM. Exterior Alkyd, Semi-Gloss (EO): MPI 94.

NN. Fast Drying Metal Primer: MPI 95.

OO. High Build Epoxy Coating: MPI 98.

PP. Epoxy Anti-Corrosive Metal Primer: MPI 101.

QQ. High Build Epoxy Marine Coating (EC): MPI 108.

RR. Interior latex, Gloss (LE) and (LG): MPI 114.

SS. Exterior Latex, High Gloss (acrylic) (AE): MPI 119.

TT. Waterborne Galvanized Primer: MPI 134.

UU. Non-Cementitious Galvanized Primer: MPI 135.

VV. Interior High Performance Latex, MPI Gloss Level 2(LF): MPI 138.

WW. Interior High Performance Latex, MPI Gloss Level 3 (LL): MPI 139.

XX. Interior High Performance Latex, MPI Gloss Level 4: MPI 140.

YY. Interior High Performance Latex (SG), MPI Gloss Level 5: MPI 141.

## **2.2 PAINT PROPERTIES**

- A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.
- B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.

## **2.3 REGULATORY REQUIREMENTS/QUALITY ASSURANCE**

- A. Paint materials shall conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
  - 1. Volatile Organic Compounds (VOC): VOC content of paint materials shall not exceed 10g/l for interior latex paints/primers and 50g/l for exterior latex paints and primers.
  - 2. Lead-Base Paint:

- a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
  - b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
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. Properly and legally 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 and Aluminum Surfaces Specified Painted:

1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with MPI 18 (Organic Zinc Rich Coating). Prime or spot prime with MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non- Cementitious Galvanized Primer) depending on finish coat compatibility.

F. Masonry, Concrete, and Cement Board:

1. Clean and remove dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
2. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. Use of solvents, acid, or steam is not permitted.
3. Remove loose mortar in masonry work.
4. Replace mortar and fill open joints, holes, cracks and depressions with new mortar specified in Section 04 05 13, MASONRY MORTARING. Do not fill weep holes. Finish to match adjacent surfaces.
5. Neutralize Concrete floors to be painted by washing with a solution of 1.4 Kg (3 pounds) of zinc sulfate crystals to 3.8 L (1 gallon) of water, allow to dry three days and brush thoroughly free of crystals.
6. Repair broken and spalled concrete edges with concrete patching compound to match adjacent surfaces as specified in CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.

G. Gypsum 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 Gypsum (Spackling Compound) finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

### **3.3 PAINT PREPARATION**

- A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.
- B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.
- C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.

- D. Mix two component and two part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.
- E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

### **3.4 APPLICATION**

- A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.
- B. Unless otherwise specified, apply paint in three coats; prime, body, and finish. When two coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.
- C. Apply each coat evenly and cover substrate completely.
- D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by Resident Engineer.
- E. Finish surfaces to show solid even color, free from runs, lumps, brushmarks, laps, holidays, or other defects.
- F. Apply by brush, roller or spray, except as otherwise specified.
- G. Do not spray paint in existing occupied spaces unless approved by Resident Engineer, except in spaces sealed from existing occupied spaces.
  - 1. Apply painting materials specifically required by manufacturer to be applied by spraying.
  - 2. In areas, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in WORK NOT PAINTED, motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.
- H. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

### **3.5 PRIME PAINTING**

- A. After surface preparation prime surfaces before application of body and finish coats, except as otherwise specified.
- B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.
- C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.
- D. Prime rebates for stop and face glazing of wood, and for face glazing of steel.
- E. Wood and Wood Particleboard:

1. Use same kind of primer specified for exposed face surface.
    - a. Exterior wood: MPI 7 (Exterior Oil Wood Primer) for new construction and MPI 5 (Exterior Alkyd Wood Primer) for repainting bare wood primer except where MPI 90 (Interior Wood Stain, Semi-Transparent (WS)) is scheduled.
    - b. Interior wood except for transparent finish: MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat), thinned if recommended by manufacturer.
    - c. Transparent finishes as specified under Transparent Finishes on Wood.
  2. Apply two coats of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) to surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reason.
  3. Apply one coat of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) as soon as delivered to site to surfaces of unfinished woodwork, except concealed surfaces of shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish.
  4. Apply MPI 67 (Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR) to wood for fire retardant finish.
- F. Metals except boilers and engine exhaust pipes:
1. Steel and iron: MPI 95 (Fast Drying Metal Primer). Use MPI 101 (Cold Curing Epoxy Primer) where MPI 77 (Epoxy Cold Cured, Gloss (EC)) or MPI 98 (High Build Epoxy Coating) finish is specified.
  2. Zinc-coated steel and iron: MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non-Cementitious Galvanized Primer) as applicable.
  3. Aluminum scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
  4. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel (EO)).
  5. Asphalt coated metal: MPI 1 (Aluminum Paint (AP)).
  6. Metal over 94 degrees C. (200 degrees F), Boilers and Engine Exhaust Pipes: MPI 22 (High Heat Resistant Coating (HR)).
- G. Gypsum Board:
1. Surfaces scheduled to have MPI 52 (Interior Latex, MPI Gloss Level 3 (LE)) or MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)) finish; use MPI 52 (Interior Latex, MPI Gloss Level 3 (LE)).
  2. Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer).

3. Use MPI 101 (Epoxy Anti-Corrosive Metal Primer) for surfaces scheduled to receive MPI 77 (Epoxy Cold Cured, Gloss (EC)) or MPI 98 (High Build Epoxy Coating) 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.
- I. Concrete Floors: MPI 60 (Interior/ Exterior Latex Porch & Floor Paint, Low Gloss).

### **3.6 EXTERIOR FINISHES**

- A. Apply following finish coats where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Steel and Ferrous Metal:
  1. Two coats of 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 and engine exhaust pipes.
- C. Machinery without factory finish except for primer: One coat MPI 94 (Exterior Alkyd, Semi-Gloss (EO)).
- D. Concrete Masonry Units and Concrete:
  1. General:
    - a. Where specified in Section 09 06 00, SCHEDULE FOR FINISHES or shown.
    - b. Mix as specified in manufacturer's printed directions.
    - c. Do not mix more paint at one time than can be used within four hours after mixing. Discard paint that has started to set.
    - d. Dampen warm surfaces above 24 degrees C (75 degrees F) with fine mist of water before application of paint. Do not leave free water on surface.
    - e. Cure paint with a fine mist of water as specified in manufacturer's printed instructions.
  2. Use two coats of TT-P-1411 (Paint, Co-polymer-Resin, Cementitious (CEP)), unless specified otherwise.

### **3.7 INTERIOR FINISHES**

- A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Metal Work:
  1. Apply to exposed surfaces.
  2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
  3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:



- a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) unless specified otherwise.
  - b. Two coats of MPI 48 (Interior Alkyd Gloss (AK)) or MPI 51 (Interior Alkyd, Eggshell (AK)) as appropriate.
  - c. Machinery: One coat MPI 9 (Exterior Alkyd Enamel (EO)).
  - d. Asphalt Coated Metal: One coat MPI 1 (Aluminum Paint (AP)).
  - e. Ferrous Metal over 94 degrees K (200 degrees F): Boiler Stacks, and Engine Exhaust Pipes:  
One coat MPI 22 (High Heat Resistant Coating (HR)).
- C. Gypsum Board:
- 1. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3 (LL)).
  - 2. Two coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2 (LF)).
  - 3. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)) or MPI 114 (Interior Latex, Gloss (LE) and (LG)).
  - 4. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 48 (Interior Alkyd Gloss (AK)).
- D. Masonry and Concrete Walls:
- 1. Over MPI 4 (Interior/Exterior Latex Block Filler) on CMU surfaces.
  - 2. Two coats of MPI 52 (Interior Latex, MPI Gloss Level 3 (LE)), MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)) or MPI 114 (Interior Latex, Gloss (LE) and (LG)) as appropriate.
- 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) or MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) (SG).
  - b. One coat MPI 67 (Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR), intumescent type (FR), on exposed wood.
  - c. One coat of MPI 45 Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 48 (Interior Alkyd Gloss (AK)).
  - d. Two coats of MPI 51 (Interior Alkyd, Eggshell) (AK)).
4. Transparent Finishes on Wood.
- a. 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 B.
    - 4) Two coats of MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV) or MPI 31 (Polyurethane Moisture Cured, Clear Gloss (PV)) as appropriate.
  - b. MPI 66 (Interior Alkyd Fire Retardant, Clear Top-Coat(ULC Approved) (FC)) Intumescent Type, Fire Retardant Coating (FC) where scheduled: Two coats.
- F. Concrete Floors: One coat of MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss (FE)).
- G. Miscellaneous:
- 1. Apply where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
  - 2. MPI 1 (Aluminum Paint): Two coats of aluminum paint.

### **3.8 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.
- 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 02 – EXISTING CONDITIONS, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY.
- D. Paint after tests have been completed.
- E. Omit prime coat from factory prime-coated items.
- F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.

G. Omit field painting of items specified in paragraph, Building and Structural WORK NOT PAINTED.

H. Color:

1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:
  - a. White .....Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on 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. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conduits containing fire alarm control wiring, and fire alarm equipment.
  - d. Federal Safety Orange: .Entire lengths of electrical conduits containing feeders 600 volts or more.
  - e. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.

I. Apply paint systems on properly prepared and primed surface as follows:

1. Exterior Locations:
  - a. Apply two coats of MPI 8 (Exterior Alkyd, Flat (EO)) to the following ferrous metal items:  
Vent and exhaust pipes with temperatures under 94 degrees C (200 degrees F), roof drains, fire hydrants, post indicators, yard hydrants, exposed piping and similar items.
  - b. Apply two coats of MPI 10 (Exterior Latex, Flat (AE)) to the following metal items:  
Galvanized metal.
  - c. Apply one coat of MPI 22 (High Heat Resistant Coating (HR)), 650 degrees C (1200 degrees F) to 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 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (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) Exterior of boilers and ferrous metal in connection with boiler settings including supporting members, doors and door frames and fuel oil burning equipment.
  - 2) Steam line flanges, bare pipe, fittings, valves, hangers and supports over 94 degrees K (200 degrees F).
  - 3) Engine generator exhaust piping and muffler.
- d. Paint electrical conduits containing cables rated 600 volts or more using two coats of MPI 8(Exterior Alkyd, Flat (EO)) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.
3. Other exposed locations:
  - a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two coats of MPI 1 (Aluminum Paint (AP)).
  - b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One coat of MPI 50 (Interior Latex Primer Sealer) and one coat of MPI 10 (Exterior Latex, Flat (AE)).

### **3.11 BUILDING AND STRUCTURAL WORK FIELD PAINTING**

- A. Painting and finishing of interior and exterior work except as specified under paragraph 3.11 B.
  1. Painting and finishing of new and existing work including colors and gloss of finish selected is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.
  2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
  3. Painting of ferrous metal and galvanized metal.
  4. Painting of wood with fire retardant paint.
  5. Identity painting and safety painting.
- B. Building and Structural Work not Painted:
  1. Prefinished items:

- a. Casework, doors, elevator entrances and cabs, metal panels, and similar items specified factory finished under other sections.
  - b. Factory finished equipment and components such as metal 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.
  - d. Pre-finished flashing and trim.
- 3. Concealed surfaces:
  - a. Inside elevator and duct shafts, interstitial spaces, pipe tunnels, above ceilings, except as otherwise specified.
  - b. Inside walls or other spaces behind access doors or panels.
  - c. Surfaces concealed behind permanently installed casework and equipment.
- 4. Moving and operating parts:
  - a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
  - b. Tracks for overhead or coiling doors, shutters, and grilles.
- 5. Labels:
  - a. Code required label, such as Underwriters Laboratories Inc., Inchcape Testing Services, Inc., or Factory Mutual Research Corporation.
  - b. Identification plates, instruction plates, performance rating, and nomenclature.
- 6. Galvanized metal:
  - a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
  - b. Gas Storage Racks.
  - c. Except where specifically specified to be painted.
- 7. Metal safety treads and nosings.
- 8. Gaskets.
- 9. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundations walls and interior walls in pipe basements.
- 10. Face brick.
- 11. Structural steel encased in concrete, masonry, or other enclosure.
- 12. Structural steel to receive sprayed-on fire proofing.
- 13. Ceilings, walls, columns in interstitial spaces.

### 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 D 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<br>EXPOSED PIPING | COLOR OF<br>BACKGROUND | COLOR OF<br>LETTERS | LEGEND<br>ABBR.  |
|----------------------------|----------------------------|------------------------|---------------------|------------------|
| A/C Condenser Water Supply |                            | Green                  | White               | A/C Cond Wtr Sup |
| A/C Condenser Water Return |                            | Green                  | White               | A/C Cond Wtr Ret |
| Chilled Water Supply       |                            | Green                  | White               | Ch. Wtr Sup      |
| Chilled Water Return       |                            | Green                  | White               | Ch. Wtr Ret      |
| Drain Line                 |                            | Green                  | White               | Drain            |
| Emergency Shower           |                            | Green                  | White               | Emg Shower       |
| High Pressure Steam        |                            | Yellow                 | Black               | H.P. 100         |
| Low Pressure Steam         |                            | Yellow                 | Black               | L.P. Stm 10      |
| Hot Water Heating Supply   |                            | Yellow                 | Black               | H. W. Htg Sup    |
| Hot Water Heating Return   |                            | Yellow                 | Black               | H. W. Htg Ret    |
| Gravity Condensate Return  |                            | Yellow                 | Black               | Gravity Cond Ret |
| Pumped Condensate Return   |                            | Yellow                 | Black               | Pumped Cond Ret  |
| Fuel Oil - Grade           |                            | Green                  | White               | Fuel Oil-Grade 2 |

|                       |       |        |       |              |
|-----------------------|-------|--------|-------|--------------|
| Chemical Feed         |       | Yellow | Black | Chem Feed    |
| Pumped Condensate     |       | Yellow | Black | Pump Cond    |
| Pump Recirculating    |       | Yellow | Black | Pump-Recirc. |
| Vent Line             |       | Yellow | Black | Vent         |
| Cold Water (Domestic) | White | Green  | White | C.W. Dom     |
| Hot Water(Domestic)   |       |        |       |              |
| Supply                | White | Yellow | Black | H.W. Dom     |
| Return                | White | Yellow | Black | H.W. Dom Ret |
| Tempered Water        | White | Yellow | Black | Temp. Wtr    |
| Sanitary Waste        |       | Green  | White | San Waste    |
| Sanitary Vent         |       | Green  | White | San Vent     |
| Storm Drainage        |       | Green  | White | St Drain     |
| Pump Drainage         |       | Green  | White | Pump Disch   |
| Atmospheric Vent      |       | Green  | White | ATV          |
| Fire Protection Water |       |        |       |              |
| Sprinkler             |       | Red    | White | Auto Spr     |
| Standpipe             |       | Red    | White | Stand        |
| Sprinkler             |       | Red    | White | Drain        |

7. See Sections for methods of identification, legends, and abbreviations of the following:

- a. 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 28.33, CONDUITS AND BACKBOXES 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.

#### **3.14 PROTECTION CLEAN UP, AND TOUCH-UP**

- A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.
- C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

- - - E N D - - -

## **SECTION 10 14 00 SIGNAGE**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. This section specifies interior signage for room identification, life safety and directional/wayfinding signs.
- B. This section specifies an Allowance value for a Building Plaque.

#### **1.2 RELATED WORK**

- A. Color Finish: Section 09 06 00, SCHEDULE FOR FINISHES
- B. Lighted Exit Signs for Egress Purposes are specified under Division 26, ELECTRICAL.

#### **1.3 MANUFACTURER'S QUALIFICATIONS**

Sign vendor shall provide evidence that they regularly and presently manufacture signs similar to those specified in this section as one of their principal products. Sign vendor shall have at least 5 years experience and have completed 5 other similar VA signage projects within the last 5 years.

#### **1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. 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.
- C. Samples: Sign panels and frames, with letters and symbols, each type. Submit 2 sets. One set of samples will be retained by Resident Engineer, other returned to Contractor.
  - 1. Sign Panel, 200 mm x 250 mm (8 inches x 10 inches), with letters.
  - 2. Color samples of each color, 150 mm x 150 mm (6 inches x 6 inches. Show anticipated range of color and texture.
  - 3. Sample of typeface, arrow and symbols in a typical full size layout.
- D. Shop Drawings: Sign location plan, showing location, type and total number of signs required. Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.
- E. Certification of meeting environmental attributes required within specification.

#### **1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

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

- A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.
- B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.
- C. Deliver signs only when the site and mounting services are ready for installation work to proceed.
- D. Store products in dry condition inside enclosed facilities.

#### **1.6 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
- B209-07 .....Aluminum and Aluminum-Alloy Sheet and Plate
- B221-08 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and tubes.
- C. Federal Specifications (Fed Spec):
- MIL-PRF-8184F .....Plastic Sheet, Acrylic, Modified.
- MIL-P-46144C.....Plastic Sheet, Polycarbonate

#### **1.7 MINIMUM SIGN REQUIREMENTS**

- A. Permanent Rooms and Spaces:
1. Tactile and Braille Characters, raised minimum 0.793 mm (1/32 in). Characters shall be accompanied by Grade 2 Braille.
2. Type Styles: Characters shall be uppercase, Helvetica Medium, Helvetica Medium Condensed and Helvetica Regular.

3. Character Height: Minimum 16 mm (5/8 in) high, Maximum 50 mm (2 in).
4. Symbols (Pictograms): Equivalent written description shall be placed directly below symbol, outside of symbol's background field. Border dimensions of symbol background shall be minimum 150 mm (6 in) high.
5. Finish and Contrast: Characters and background shall be eggshell, matte or other non-glare finish with adequate contrast with background.
6. Mounting Location and Height: To comply with ADA Regulations. Mount on wall adjacent to the latch side of the door and to avoid door swing and protruding objects.

**B. Overhead Signs:**

1. Type Styles: As shown on Sign Plans. Characters shall have a width-to-height ratio between 3:5 and 1:1. Characters shall have a stroke width-to-height ratio of between 1:5 and 1:10.
2. Character Height: minimum 75 mm (3 in) high for overhead signs. As shown on sign plans, for directional signs.
3. Finish and Contrast: Same as for signs of permanent rooms and spaces.
4. Mounting Location and Height: As shown on sign plans.

**1.8 COLORS AND FINISHES:**

Refer to Section 09 06 00, SCHEDULE FOR FINISHES.

**1.9 REPLACEMENT AVAILABILITY**

All products designed must be readily available non-proprietary items on GSA Schedule for ease in future procurement. All signs must be American made and under standard GSA warranties.

**1.10 DELEGATED DESIGN**

- A. The General Contractor shall have a representative from the sign manufacturer's create location and verbiage plans for the Owner to approve, and from which the General Contractor is to order.
- B. Coordinate and determine exact verbiage and quantities prior to ordering signs.

**1.11 BUILDING PLAQUE ALLOWANCE**

- A. Contractor shall allow \$500.00 (Five-Hundred Dollars) for one metal building plaque.
- B. This allowance shall be for the purchase of the plaque, F.O.B. to the job site.
- C. Information shall be furnished to the Contractor on the building plaque based on the Owner's requirements at a later date.
- D. Labor, installation, taxes, insurance, overhead, and profit shall be in the Base Bid.
- E. Any excess monies at the end of the job will be returned to the Owner by Change Order Credit.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Signs of type, size and design shown on the sign plan drawings and as specified.
- B. Signs complete with lettering, framing and related components for a complete installation.
- C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- D. Do not scale drawings for dimensions. Contractor to verify and be responsible for all dimensions and conditions shown by these drawings. Resident Engineer to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.

### **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. Matte 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 Times New Roman. Initial caps or all caps as indicated in Sign Message Schedule.
  - 2. Arrow: See graphic standards on sign plan drawings.
  - 3. Letter spacing: See graphic standards on sign plan drawings.
  - 4. Letter spacing: See graphic standards on sign plan drawings.
  - 5. All text, arrows, and symbols to be provided in size, colors, typefaces and letter spacing shown. Text shall be a true, clean, accurate reproduction of typeface(s) shown. Text shown on sign plan drawings are for layout purposes only; final text for signs is listed in Sign Message Schedule, as produced by the sign manufacturer and approved by the Resident Engineer.

## 2.4 CONSTRUCTION

Interior Signs- are composed of two ply—1/16” matte faceplate laminated to 1/8” clear back plate with No.CC69017c compound high performance contact adhesive - shear strength and tack/heat resistance greater than pressure sensitive adhesives. Pocket signs created using No. 38 -.080” separating rib(s) to form insert space for custom computer generated acetate with package results in 5 3/16” inserts and 2 1/16” inserts (the use of adhesive strips instead of ribs is not acceptable). Signs to nest into Type OS22 custom extruded, precision mitered, aluminum frame composed of clear anodized aluminum with a minimum of 75% recycled content. Frame is to be assembled with a two part epoxy process using composite board back plate made of recycled content and EPP Downstream Certified. The room number portion to use injected molded ABS characters. Grade II Braille to be produced with high pressure surface beading directly below tactile number 3/16” minimum. Braille translation via Duxbury Braille translator. Subsurface screen inks must be equal to NAZ-DAR Industrial Lacquer #7200 –series with 2-Propoxyethanol CAS # 2807-30-9; 2-Butoxethanol CAS # 111-76-2 ; Isopropyl Alcohol CAS # 67-63-0; Toluene CAS#108-88-3 and must match #6213 Jade with black text (HM). All sign colors and non ADA copy must be subsurface applied. Surface color or copy including laminates is not acceptable.

## 2.5 FABRICATION

- A. Design components to allow for expansion and contraction for a minimum material temperature range of 56 °C (100 °F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
- B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever and wherever possible.
- C. Shop fabricate so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.
- D. Contact surfaces of connected members be true. Assembled so joints will be tight and practically unnoticeable, without use of filling compound.
- E. Signs shall have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces be smooth flat and without oil-canning, free of rack and twist. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches. Restore texture to filed or cut areas.
- F. Level or straighten wrought work. Members shall have sharp lines and angles and smooth surfaces.

- G. Extruded members to be free from extrusion marks. Square turns and corners sharp, curves true.
- H. Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.
- I. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Edge joints tightly mitered to give appearance of solid material.
- J. All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.
- K. Movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of members. Doors and covers centered in opening or frame. All contact surfaces fit tight and even without forcing or warping components.
- L. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- M. No signs are to be manufactured until final sign message schedule and location review has been completed by the Resident Engineer & forwarded to contractor.

## **2.6 DETAILED SCOPE**

- A. Room Identification: Provide a type D1A/F/W 9" x 9" changeable Slot Framed ADA Room ID for all hard wall rooms. Electrical, Telecom and Mechanical rooms shall receive a type D1A/W-3" x 9" Framed Room Number. All Restrooms and Stairs shall receive sign type SA/W- 9" x 9" Framed ADA Stair / Restroom ID and a type D1A/W- 3" x 9" Framed ADA Room Number. A complete sign message schedule identifying each sign, its message and its type should be provided by sign manufacturer for approval by the Resident Engineer. Room Identification signs must feature an open license application that auto scales copy to fit each sign to create new sign inserts in house on any standard computer and printers. Refer to sign plan drawings for design. See sign schedule for further detail.
- B. Directional Signs: Provide plan for primary and secondary wayfinding components at all decision points and key node areas requiring directional information. Emphasis should be placed on areas and services commonly sought-after by Veterans and their families. Provide various directional/wayfinding components including sign types Ca/P/W- modular directional signs, type C4-df overhead signs, type P5/W wall mounted panel signs, Type P/E1/W "pocket signs", type G-d/f right angle target signs, and other components per attached drawing package. Specify components outside each main hall decision point, pedestrian node, check-in desk and primary

intersection as deemed appropriate and necessary by environmental graphics designer. Right Angle signs should be located outside of each restroom and other high volume destinations.

- C. Life Safety signage as attached includes type V/W changeable evacuation plans, type E/W pull station (RACE) information, type G-d/f fire extinguisher id, type V4/W stairwell fire-door signs, type V3/W elevator warnings at all call buttons and type Q/W authorized personnel only sign at all appropriate door locations. (REFER TO ATTACHED SIGNAGE COMPONENT DRAWINGS AND ESTIMATED QUANTITIES FOR EACH TYPE LISTED ABOVE).
- D. At completion of sign installation, clean exposed sign surfaces. Clean and repair any adjoining surfaces that become soiled or damages as a result of installing signs.
- E. Locate signs as shown on the sign location plans approved by the Resident Engineer.
- F. 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 sign is to be the same size as sign being installed.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Protect products against damage during field handling and installation.
- B. Mount signs in proper alignment, level and plumb according to the sign location plan and the dimensions given on elevation and sign location drawings. Where otherwise not dimensioned, signs shall be installed where best suited to provide a consistent appearance throughout the project. When exact position, angle, height or location is in doubt, contact Resident Engineer for clarification.
- C. Remove or correct signs or installation work Resident Engineer determines as unsafe or as an unsafe condition.

### **3.2 ESTIMATES**

- A. VA Little Rock OEF/OIF Estimate

| <u>Sign Type</u>          | <u>Description</u>                     | <u>Qty</u> |
|---------------------------|--|------------|
| <b><u>ROOM ID</u></b>     |  |            |
| D1A/F/W                   | 9" x 9" Framed ADA Rm Function         | 68         |
| D1A/W                     | 3" x 9" Framed ADA Room #              | 25         |
| SA/W                      | 9" x 9" Framed ADA Stair & Restroom ID | 16         |
| <b><u>LIFE SAFETY</u></b> |  |            |
| V/W                       | 18" x 18" Framed Fire Exit Plan        | 8          |
| V Art                     | Artwork Preparation                    | 2          |
| E/W                       | 6" x 9" Framed RACE signs              | 8          |



|         |  |   |
|---------|--|---|
| G D/F   | 9" x 9" Right Angle Mount - Fire Equipment | 8 |
| V3/W    | 9" x 9" Framed Elevator Warning            | 0 |
| V4/W    | 9" x 9" Framed Fire Door                   | 2 |
| Q/R/S/W | 9" x 9" Framed Regulatory Graphics         | 4 |

#### **DIRECTIONALS**

|        |   |   |
|--------|---|---|
| Ca/P/W | 15" x 17" Framed Pocket w/Header &<br>11" x 17" Changeable Acetate Insert | 6 |
| C4 D/F | Overhead ID - Ceiling Mount 9" x 48" Double Face                          | 4 |
| G D/F  | 9" x 12" Right Angle Restroom Mount ID                                    | 7 |
| P5/W   | 12" x 12" Framed Solid Panel Directional                                  | 6 |
| P/E1/W | 15" x 10" Framed Footer w/8-1/2" x 11" Slot & Ins                         | 6 |

#### B. BA Little Rock North Estimate

| <b><u>Sign Type</u></b>    | <b><u>Description</u></b>   | <b><u>Qty</u></b> |
|----------------------------|---|-------------------|
| <b><u>ROOM ID</u></b>      |   |                   |
| D1A/F/W                    | 9" x 9" Framed ADA Rm Function  | 65                |
| D1A/W                      | 3" x 9" Framed ADA Room #   | 38                |
| SA/W                       | 9" x 9" Framed ADA Stair & Restroom ID                                    | 25                |
| <b><u>LIFE SAFETY</u></b>  |   |                   |
| V/W                        | 18" x 18" Framed Fire Exit Plan   | 9                 |
| V Art                      | Artwork Preparation   | 3                 |
| E/W                        | 6" x 9" Framed RACE signs   | 12                |
| G D/F                      | 9" x 9" Right Angle Mount - Fire Equipment                                | 12                |
| V3/W                       | 9" x 9" Framed Elevator Warning   | 3                 |
| V4/W                       | 9" x 9" Framed Fire Door  | 6                 |
| Q/R/S/W                    | 9" x 9" Framed Regulatory Graphics  | 10                |
| <b><u>DIRECTIONALS</u></b> |   |                   |
| Ca/P/W                     | 15" x 17" Framed Pocket w/Header &<br>11" x 17" Changeable Acetate Insert | 9                 |
| C4 D/F                     | Overhead ID - Ceiling Mount 9" x 48" Double Face                          | 6                 |
| G D/F                      | 9" x 12" Right Angle Restroom Mount ID                                    | 11                |
| P5/W                       | 12" x 12" Framed Solid Panel Directional                                  | 9                 |
| P/E1/W                     | 15" x 10" Framed Footer w/8-1/2" x 11" Slot & Ins                         | 8                 |

#### C. VA Little Rock South Estimate

| <b><u>Sign Type</u></b> | <b><u>Description</u></b> | <b><u>Qty</u></b> |
|-------------------------|---------------------------|-------------------|
|-------------------------|---------------------------|-------------------|

**ROOM ID**

|         |  |    |
|---------|--|----|
| D1A/F/W | 9" x 9" Framed ADA Rm Function         | 95 |
| D1A/W   | 3" x 9" Framed ADA Room #              | 30 |
| SA/W    | 9" x 9" Framed ADA Stair & Restroom ID | 24 |

**LIFE SAFETY**

|         |  |   |
|---------|--|---|
| V/W     | 18" x 18" Framed Fire Exit Plan            | 9 |
| V Art   | Artwork Preparation                        | 3 |
| E/W     | 6" x 9" Framed RACE signs                  | 9 |
| G D/F   | 9" x 9" Right Angle Mount - Fire Equipment | 9 |
| V3/W    | 9" x 9" Framed Elevator Warning            | 3 |
| V4/W    | 9" x 9" Framed Fire Door                   | 6 |
| Q/R/S/W | 9" x 9" Framed Regulatory Graphics         | 8 |

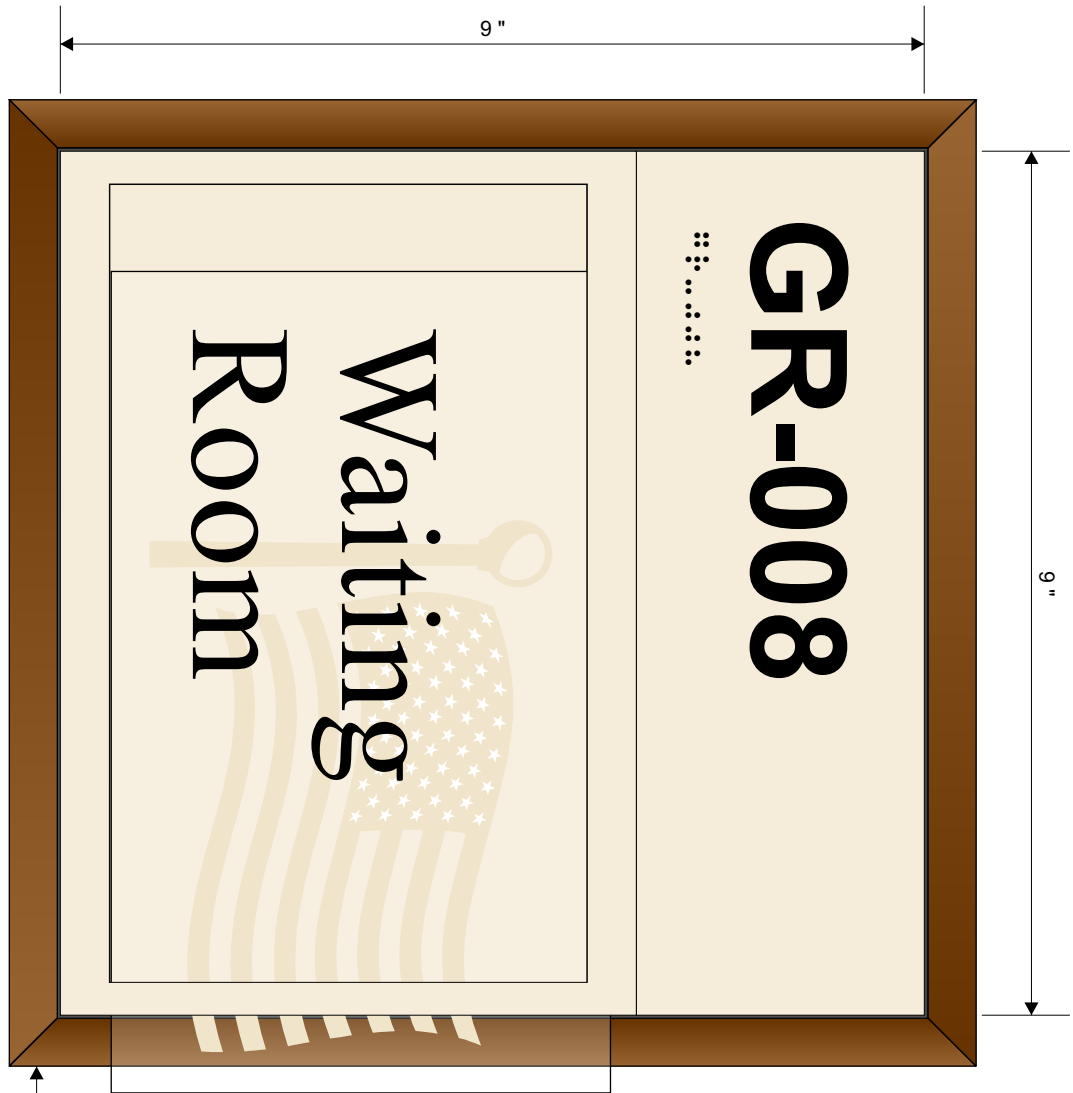
**DIRECTIONALS**

|        |   |    |
|--------|---|----|
| Ca/P/W | 15" x 17" Framed Pocket w/Header &<br>11" x 17" Changeable Acetate Insert | 8  |
| C4 D/F | Overhead ID - Ceiling Mount 9" x 48" Double Face                          | 4  |
| G D/F  | 9" x 12" Right Angle Restroom Mount ID                                    | 8  |
| P5/W   | 12" x 12" Framed Solid Panel Directional                                  | 12 |
| P/E1/W | 15" x 10" Framed Footer w/8-1/2" x 11" Slot & Ins                         | 6  |

**3.3 SAMPLES**

- A. VAMC North Little Rock – Interior Signs Manual: Attached to this section please find the Interior Signs Manual as provided by the VAMC North Little Rock.

- - - END - - -



Type D1A - 3" x 9" w/  
1" & 3/4" x 1/32" ADA  
Tactile Numerals  
& Grade II Braille

Type F - 6" x 9"  
Removable F-Unit  
CSS-GOW Off-White Subsurface

"US Flag Watermark" (TBD)  
on 5-3/16" x 9" x 1/16"  
Clear Acrylic Insert

5-3/16" x 9"  
Clear Acetate Insert  
with TNR Copy

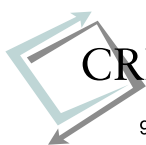
Supply CSS Custom F-Scale  
Software For In House Updating of  
Acetate Insert

CSS-OS22 Beveled  
Bronze Anodized Frame  
Sign frames to contain  
75% Recycled content.  
Sign backing to be an Environmentally  
Preferable Product (EPP Downstream Certified)

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:2    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type: D1A/F/W

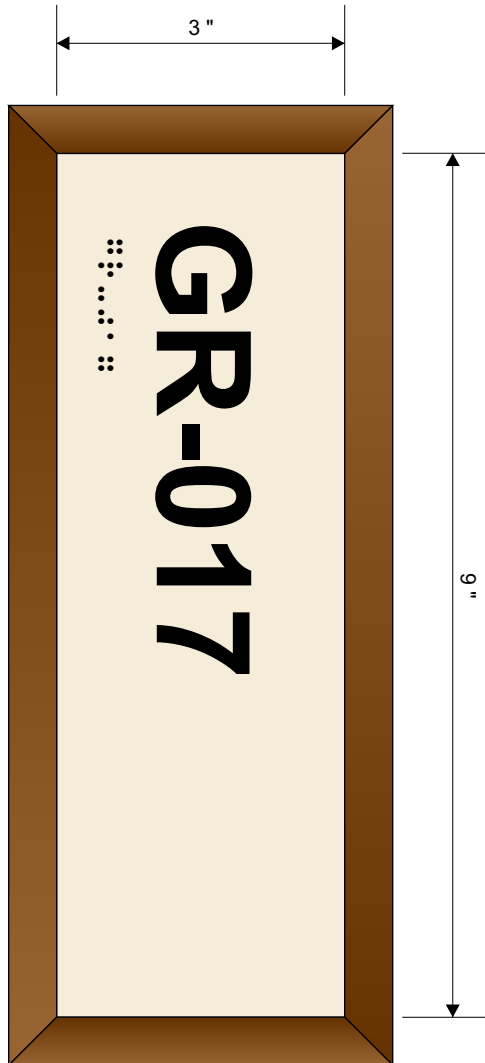


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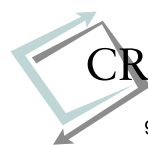


- 1" x 1/32"  
ADA Tactile Numeral  
& Grade II Braille  
CSS-GOW Off-White Subsurface
- CSS-OS22 Beveled  
Bronze Anodized Frame  
Sign frames to contain  
75% Recycled content.  
Sign backing to be an  
Environmentally Preferable Product  
(EPP Downstream Certified)

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:2    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type: D1A/W

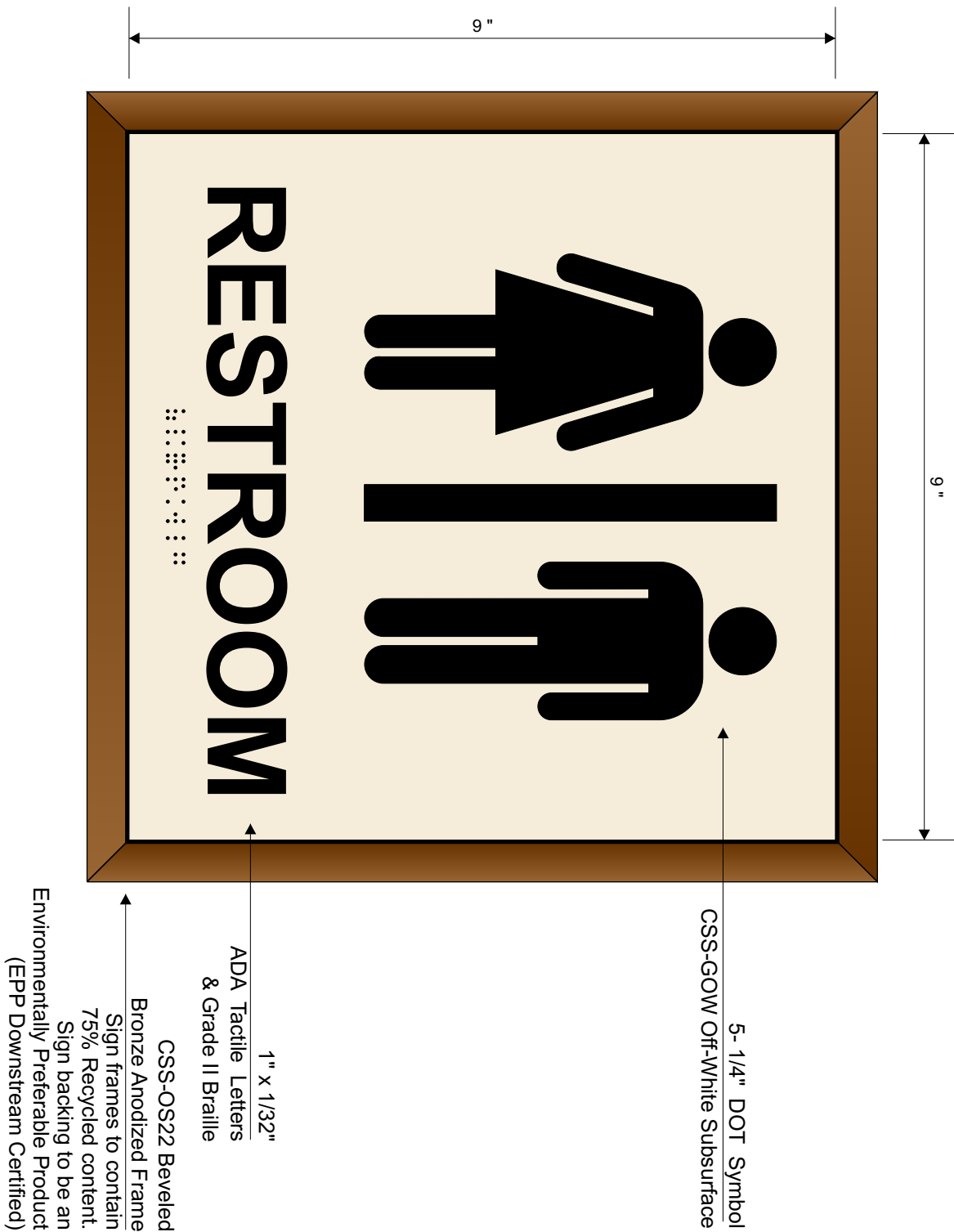


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VAM Little Rock Dwg Int. Signs

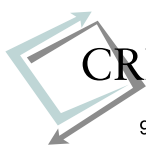
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|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:2    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type: SA/W

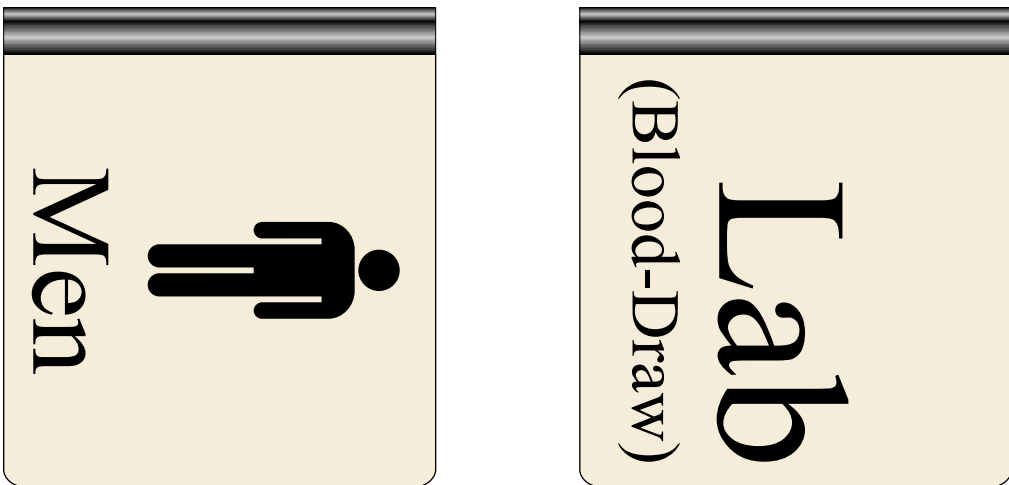
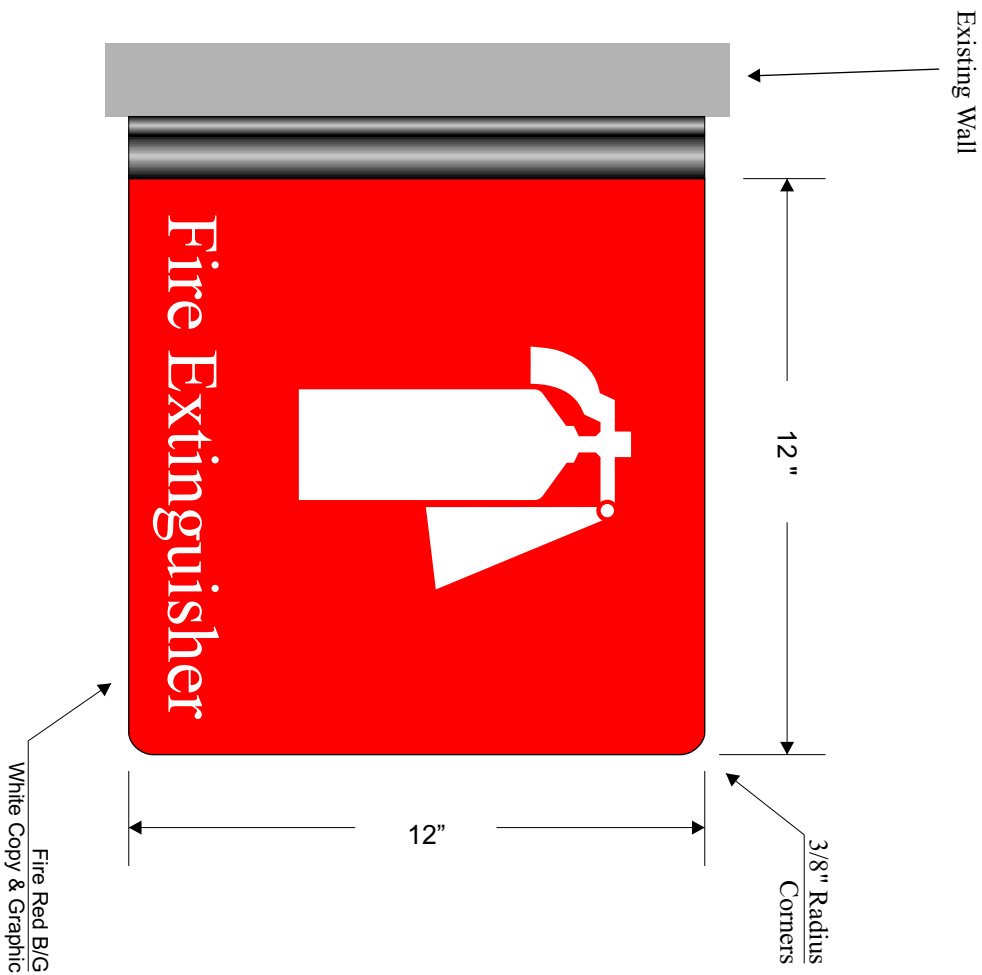


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VAlittleRockDwgInt.Signs

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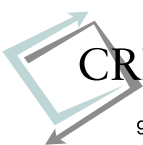
Mounted at a right angle to the wall, these single or double-faced signs are available with copy or graphic symbol. Regulation graphic symbol colors where applicable. Bracket: Black Sign: Three-Ply Acrylic

CSS-GOW Off-White Subsurface

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:4    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type: G-Right Angle D/F

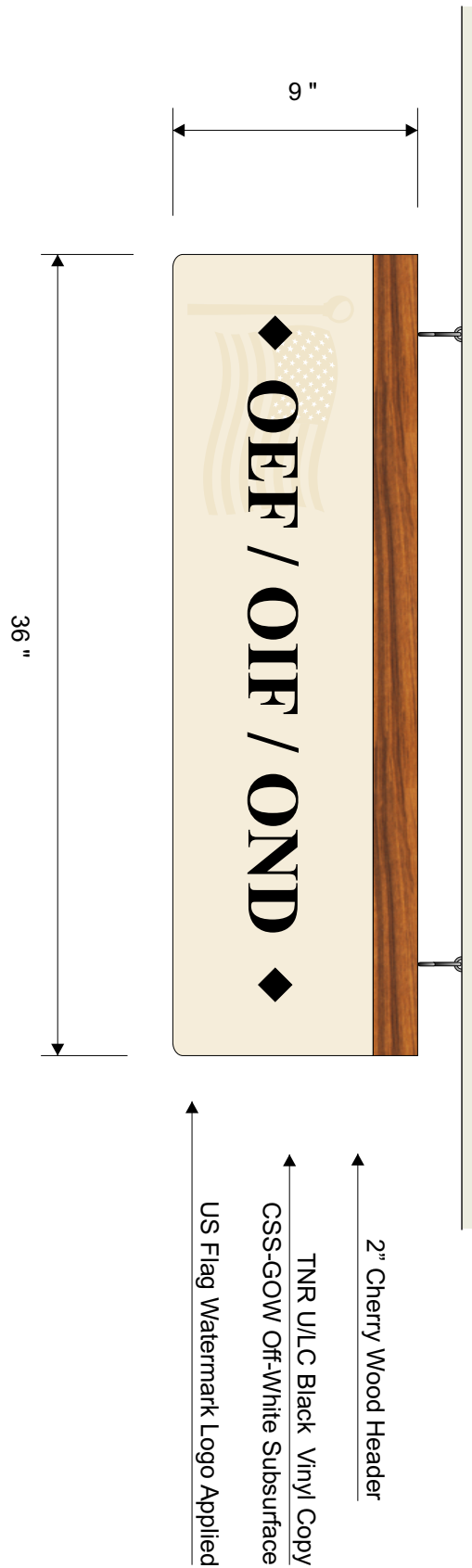
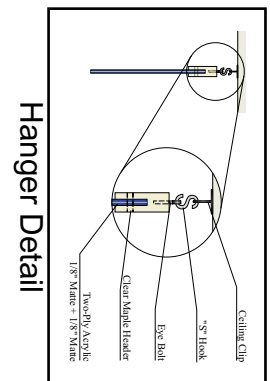


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2" Cherry Wood Header

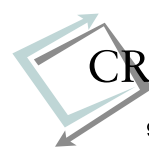
TNR U/LC Black Vinyl Copy  
CSS-GOW Off-White Subsurface

US Flag Watermark Logo Applied

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:8    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

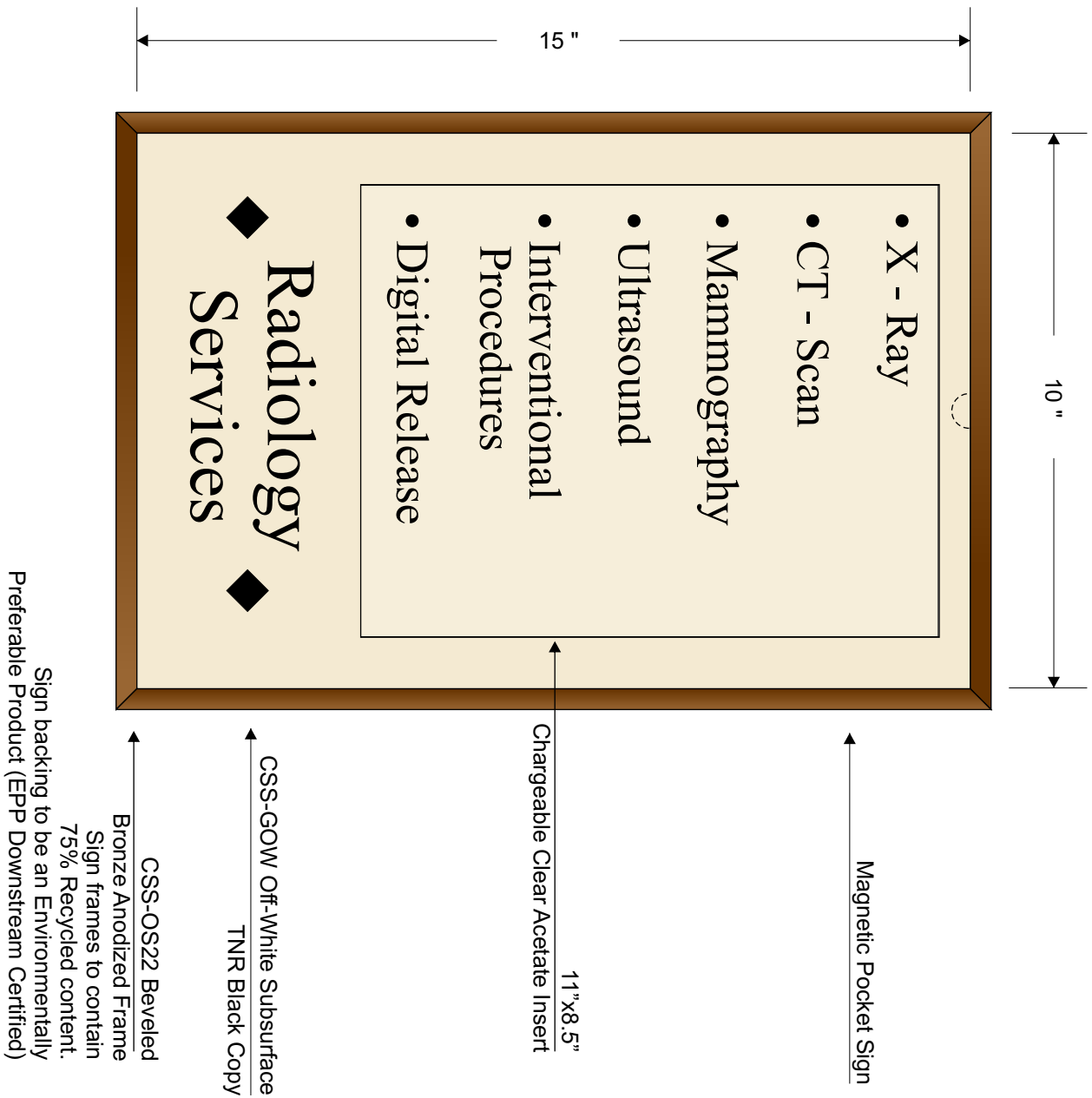
Type C4 (D/F) Overhead



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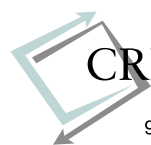
VAMC North Little Rock, AR



VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:3    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type: P/E1/W



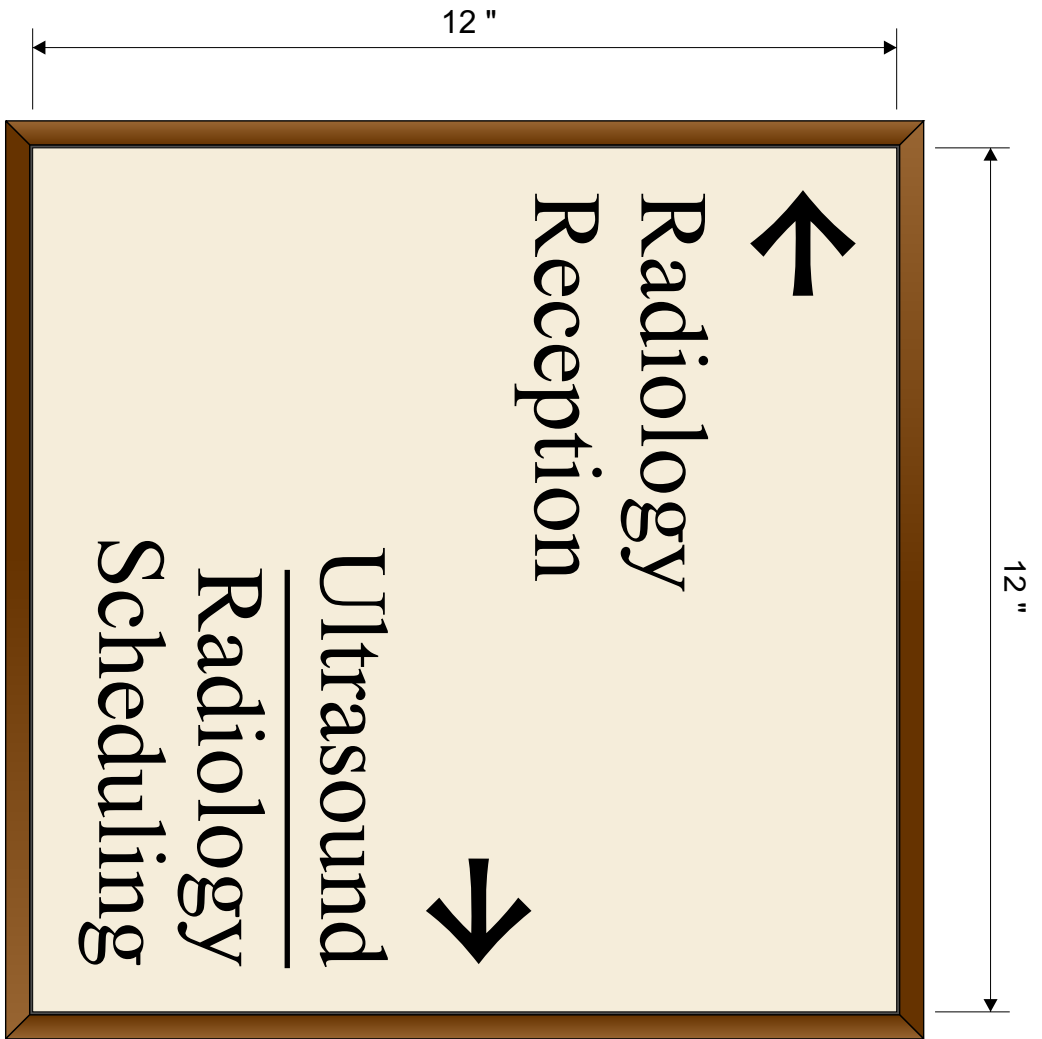
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VALLiterRockDwgIntl.Signs

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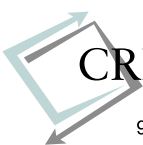
CSS-GOW Off-White Subsurface  
TNR Black Copy

CSS-OS22 Beveled  
Bronze Anodized Frame  
Sign frames to contain  
75% Recycled content.  
Sign backing to be an Environmentally  
Preferable Product (EPP Downstream Certified)

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:4    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type: P5/W

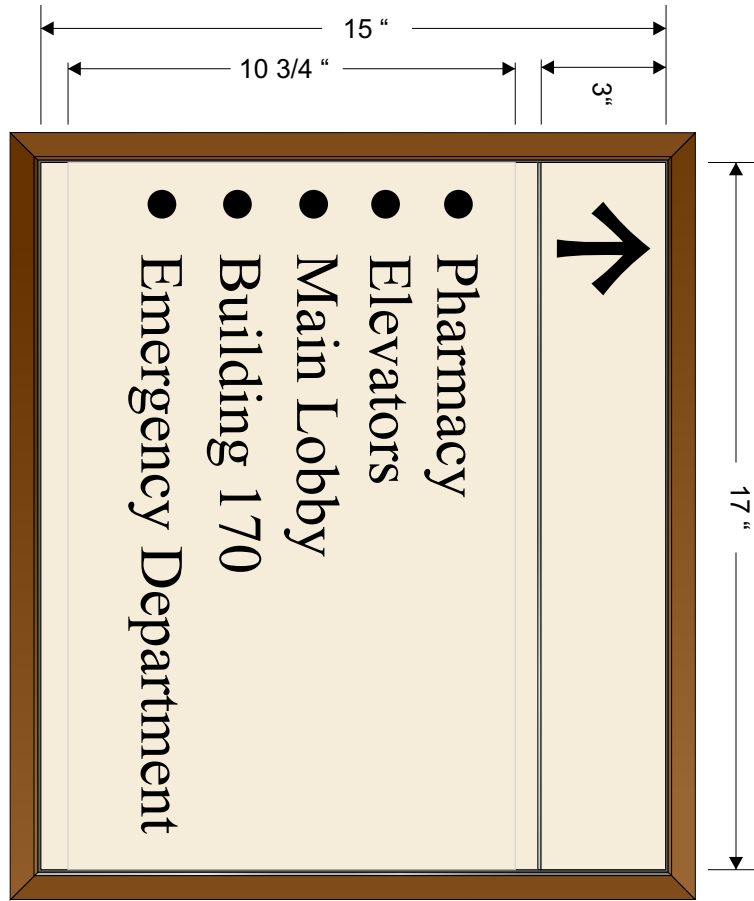


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Magnetic Arrow Panel  
Off-White BG w/ Black  
Directional Arrows

Divider Bar

11"x17"  
Changeable  
Acetate Insert

Magnetic Pocket Sign

CSS-OS22 Beveled  
Bronze Anodized Frame  
Sign frames to contain  
75% Recycled content.  
Sign backing to be an Environmentally  
Preferable Product (EPP Downstream Certified)

VAMC North Little Rock, AR

Scale: 1:4.616

Designer: Peter Van Allen

Drawn By: Miracle

Date: 1.16.12

Revised:

Page: 1

Type: Ca/P/W

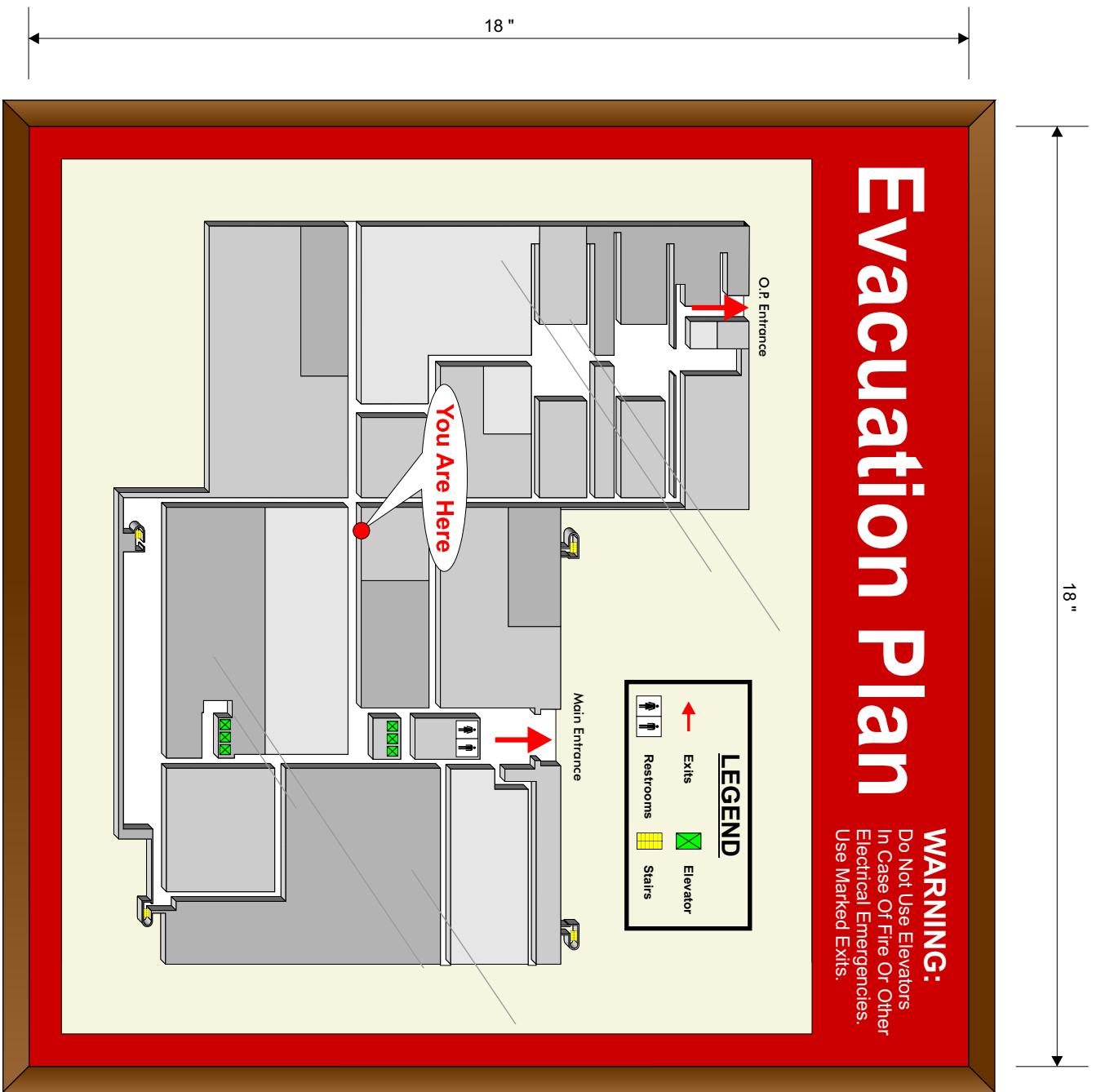


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VALLiterRockDwgInt:Signs

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Fire Red B/G  
Arial Bold White Copy

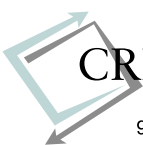
Magnetic Pocket Sign  
Accommodates  
Computer Generated  
Slide-In Floorplan

CSS-OS22 Beveled  
Bronze Anodized Frame  
Sign frames to contain  
75% Recycled content.  
Sign backing to be an  
Environmentally Preferable Product  
(EPP Downstream Certified)

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:3    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type: V/W

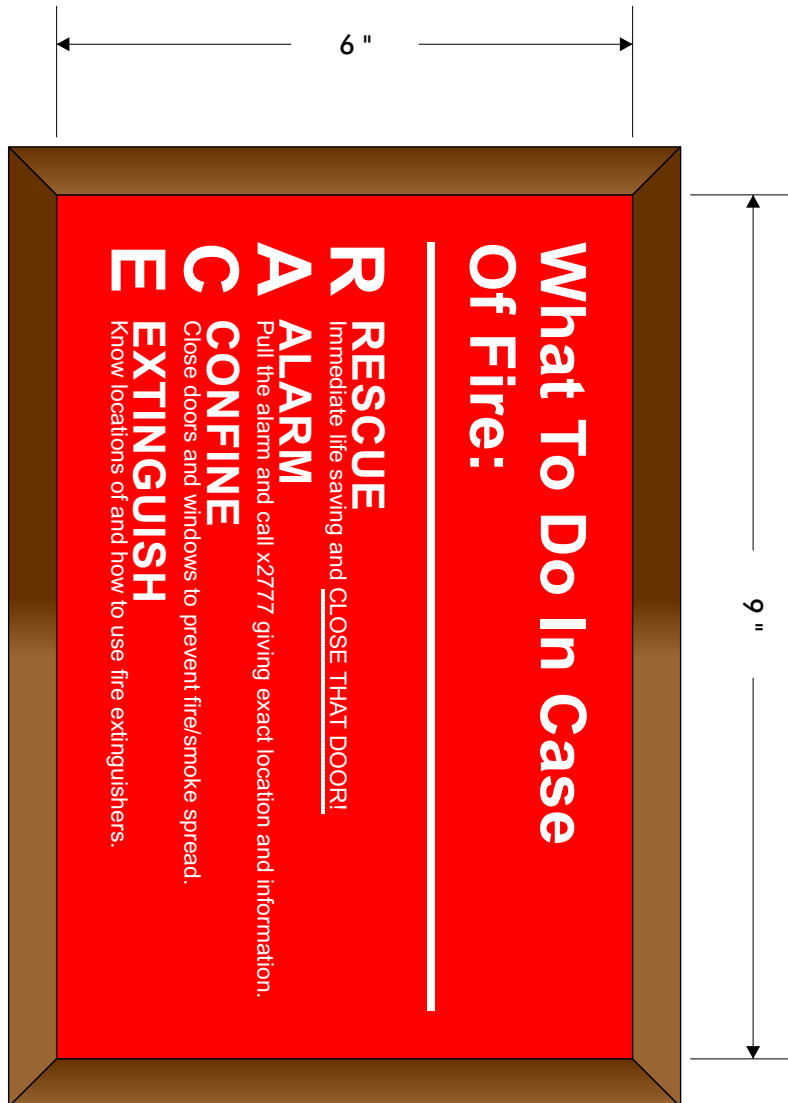


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VALLiterRockDmgInt.Signs

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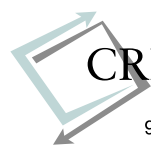
Fire Red B/G  
White Arial Bold  
Subsurface

CSS-QS22 Beveled  
Bronze Anodized Frame  
Sign frames to contain  
75% Recycled content.  
Sign backing to be an  
Environmentally Preferable Product  
(EPP Downstream Certified)

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:2    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

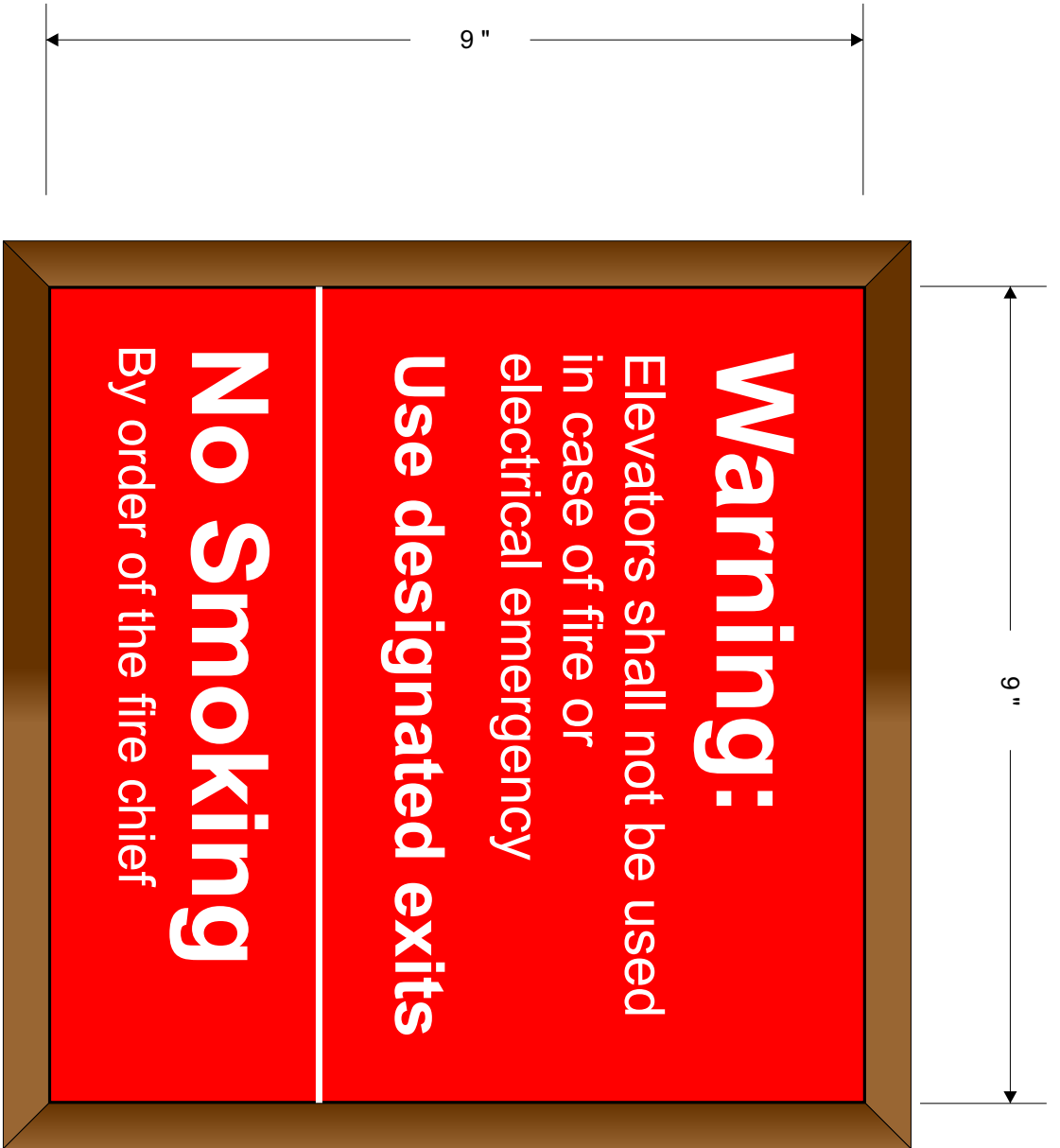
Type E/W - RACE Sign



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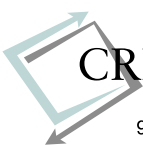
Fire Red B/G  
White Arial Bold  
Subsurface

CSS-OS22 Beveled  
Bronze Anodized Frame  
Sign frames to contain  
75% Recycled content.  
Sign backing to be an  
Environmentally Preferable Product  
(EPP Downstream Certified)

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale:        | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type: V3/W

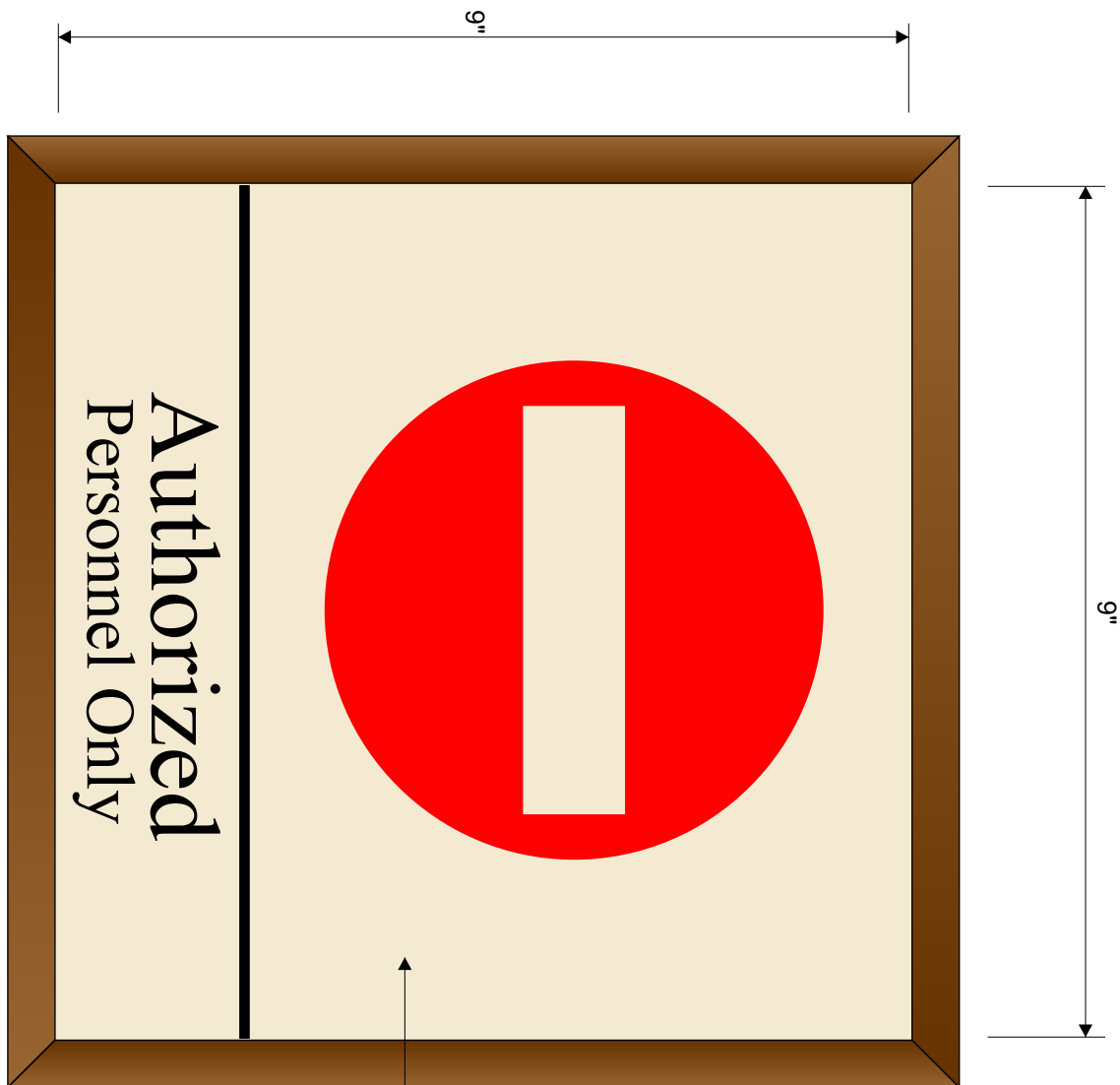


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VALtiteRockDmgIntlSigns

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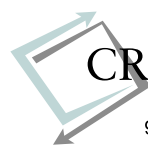
Fire RedGraphic  
GOW Background w/  
TNR Black Copy

CSS-OS22 Beveled  
Bronze Anodized Frame  
Sign frames to contain  
75% Recycled content.  
Sign backing to be an  
Environmentally Preferable Product  
(EPP Downstream Certified)

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:2    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type Q/W

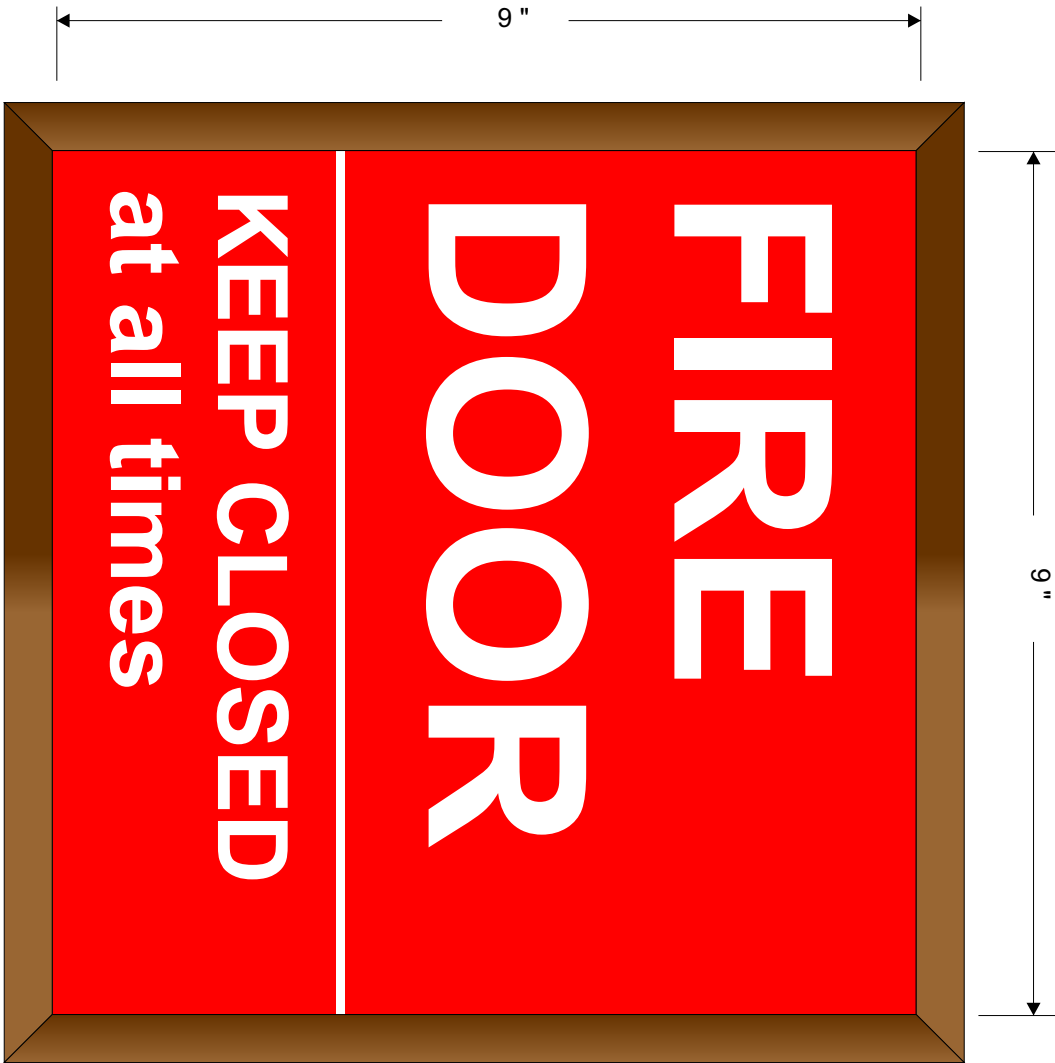


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VALLiterRockDwgnInt.Signs

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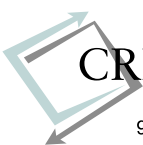
Fire Red B/G  
White Arial Bold  
Subsurface

CSS-OS22 Beveled  
Bronze Anodized Frame  
Sign frames to contain  
75% Recycled content.  
Sign backing to be an  
Environmentally Preferable Product  
(EPP Downstream Certified)

VAMC North Little Rock, AR

|               |                           |                   |
|---------------|---------------------------|-------------------|
| Scale: 1:2    | Designer: Peter Van Allen | Drawn By: Miracle |
| Date: 1.16.12 | Revised:                  | Page: 1           |

Type V4/W



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VALlittleRockDwgInt Signs

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## SECTION 10 14 53

### TRAFFIC SIGNAGE

#### PART 1 - GENERAL

##### 1.1 WORK INCLUDED

- A. Provide signage and posts as indicated on drawings

##### 1.2 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver materials to the site until the areas in which they are to be installed are ready to receive them, unless the materials can be stored in an enclosed covered area on the site.
- B. Deliver materials to the site in protective coverings designed to protect their furnishings.
- C. Protect materials before, during and after installation, and in the event of damage, make all repairs and replacements necessary at no additional cost to the Owner.

##### 1.3 SUBMITTALS

- A. See Related Work

#### PART 2 - PRODUCTS

##### 2.1 SIGN

- A. See Manual on Uniform Traffic Control Devices (MUTCD) for all traffic signage standards.

#### PART 3 - EXECUTION

##### 3.1 INSTALLATION

- A. Fasten signs securely to posts with corrosion resistant steel bolts, washers, and nuts.
- B. Drive posts in ground or set in concrete foundation as necessary to hold sign in proper and permanent position to resist swaying in the wind and displacement by vandalism.
- C. Mount bottom of stop sign 7 feet above finished grade where adjacent to pedestrian paths

END OF SECTION



## **SECTION 10 21 13 TOILET COMPARTMENTS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This section specifies solid polyethylene toilet partitions and urinal screens.

#### **1.2 RELATED WORK**

- A. Blocking within Wall Construction: Section 06 10 00, ROUGH CARPENTRY
- B. Color and Texture of Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Grab bars and toilet tissue holders: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.

#### **1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples: 150 mm (six-inch) square sample of each exposed product for each color and texture specified.
- C. Manufacturer's Literature and Data: Specified items indicating all hardware and fittings, material, finish, and latching.
- D. Shop Drawings: Construction details at 1/2 scale, showing installation details, anchoring and leveling devices.
- E. Manufacturer's certificate, attesting that zinc-coatings conform to specified requirements.
- D. Maintenance Data.

#### **1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **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. Federal Specifications (Fed. Spec.):  
FF-B-575C .....Bolt, Hexagon and Square
- C. Code of Federal Regulations (CFR):  
40 CFR 247 .....Comprehensive Procurement Guidelines for Products Containing  
Recovered Materials
- D. Commercial Item Descriptions (CID):  
A-A-1925 .....Shield, Expansion (Nail Anchors)  
A-A-60003 .....Partitions, Toilet, Complete

## **PART 2 - PRODUCTS**

### **2.1 FABRICATION**

- A. Solid, high-density polyethylene (HDPE): 25mm (1 inch) minimum thickness; water resistant; graffiti resistant; non-absorbent; contain a minimum 30 percent post consumer recycled plastic; Class C flame spread rating.
- B. Conform to Fed. CID A-A-60003, except as modified herein.
- C. Fabricate to dimensions shown or specified.
- D. Toilet Enclosures:
  - 1. Type 1, A (Floor supported) and C (overhead braced).
  - 2. Reinforce panels shown to receive toilet tissue holders or grab bars.
  - 3. Upper pivots and lower hinges adjustable to hold doors open 30 degrees.
  - 4. Latching devices and hinges for handicap compartments shall comply with ADA and Barrier Free Design requirements.
  - 5. Keeper:
    - a. U-slot to engage bar of throw latch.
    - b. Combined with rubber bumper stop.
  - 6. Wheelchair Toilets:
    - a. Upper pivots and lower hinges to hold out-swinging doors in closed position.
    - b. Provide U-type doors pulls, approximately 100 mm (four inches) long on pull side.
  - 7. Finish Color and Texture: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
  - 8. Pilaster Shoes: Fabricated from stainless steel sheet, not less than three (3) inches (76mm) high, finished to match hardware.

9. Overhead Bracing: Manufacturer's continuous extruded – aluminum head rail with anti-grip profile and in manufacturer's standard finish.
- 10 Coat Hook: Manufacturer's standard, combination hook and rubber-tipped bumper, sized to prevent in-swing door from hitting compartment-mounted accessories.
- 11 Heat-Sink Strip: Manufacturer's standard continuous extruded aluminum or stainless steel strip fastened to exposed bottom edge of components to prevent burning.
- 12 Door Size and Swings: Unless otherwise indicated, provide 24-inch (610mm) wide, in-swinging doors for standard toilet compartment and 36-inch (914mm) wide, out-swinging doors with a minimum 32-inch (813mm) wide, clear opening for compartments designated as accessible.

D. Urinal Screens:

1. Type III, Style D (wall hung).
  - a. With integral flanges and continuous, full height wall anchor plate.
  - b. Option: Full height continuous U-Type bracket.
  - c. Wall anchor plate drilled for a minimum of 4 anchors on both sides of screen.
2. Screen 600 mm (24 inches) wide and 1200 mm (48 inches high).
3. Finish Color and Texture: Same as toilet enclosure.

## **2.2 FASTENERS**

- A. Partition Fasteners: CID A-A-60003.
- B. Use expansion bolts, CID A-A-60003, for anchoring to solid masonry or concrete.
- C. Use toggle bolts, CID A-A-60003, for anchoring to hollow masonry or stud framed walls.
- D. Use steel bolts FS-B-575, for anchoring pilasters to overhead steel supports.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General:
  1. Comply with manufacturer's written installation instructions.
  2. At toilet compartments: Provide maximum 12" clear from finish floor to bottom of partitions, and install partitions such that the top of the partitions are at 6'-0" above finish floor.
  3. At urinal screens: Provide maximum 12" clear from finish floor to bottom of partitions, and install partitions such that the top of the partitions are at 5'-0" minimum above finish floor.
  4. Install in rigid manner, straight, plumb and with all horizontal lines level.
  5. Conceal evidence of drilling, cutting and fitting in finish work.
  6. Use hex-bolts for through-bolting.

7. Adjust hardware and leave in freely working order.
8. Clean finished surfaces and leave free of imperfections.

B. Panels and Pilasters:

1. Support panels, except urinal screens, and pilaster abutting building walls near top and bottom by stirrup supports secured to partitions with through-bolts.
2. Secure stirrups to walls with two suitable anchoring devices for each stirrup.
3. Secure panels to faces of pilaster near top and bottom with stirrup supports, through-bolted to panels and machine screwed to each pilaster.
4. Secure edges of panels to edges of pilasters near top and bottom with "U" shaped brackets.
5. Where overhead braced, secure pilasters to building walls by headrails clamped on or set into top of each pilaster.
  - a. Secure clamps to pilasters with two through-bolts to each clamp.
  - b. When headrails are set into pilasters, through-bolt them to the pilasters.
  - c. Support headrails on wall flange fittings secured to building walls with minimum of two anchor bolts to each flange fitting.

C. Urinal Screens:

1. Anchor urinal screen flange to walls with minimum of four bolts both side of panel.
2. Space anchors at top and bottom and equally in between.

--- E N D ---

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies corner guards.

**1.2 RELATED WORK**

- A. Structural steel corner guards: Section 05 50 00, METAL FABRICATIONS.
- B. Armor plates and kick plates not specified in this section: Section 08 71 00, DOOR HARDWARE.
- C. 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. Corner Guards.
- D. Test Report: Showing that resilient material complies with specified fire and safety code requirements.
- E. Samples: For each exposed product and for each color and texture specified, 300 mm (12-inches) long.
- F. Closeout Data: Maintenance Data.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.5 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.

## **1.6 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):
  - A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
  - B221-08 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
  - D256-06 .....Impact Resistance of Plastics
  - D635-06 .....Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
  - E84-09.....Surface Burning Characteristics of Building Materials
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
  - AMP 500-06 .....Metal Finishes Manual
- D. National Fire Protection Association (NFPA):
  - 80-10 .....Standard for Fire Doors and Windows
- E. Society of American Automotive Engineers (SAE):
  - J 1545-05.....Instrumental Color Difference Measurement for Exterior Finishes.
- F. Underwriters Laboratories Inc. (UL):
  - Annual Issue .....Building Materials Directory

## **1.7 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures.

- b. Deterioration of plastic and other materials beyond normal use.
- 2. Warranty Period: Five years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Aluminum Extruded: ASTM B221, Alloy 6063, Temper T5 or T6.
- B. Resilient Material:
  - 1. Extruded and injection molded acrylic vinyl or extruded polyvinyl chloride meeting following requirements:
    - a. Minimum impact resistance of 1197 ps (25 ft lbs per sq.ft) when tested in accordance with ASTM D256 (Izod impact, ft.lbs. per inch notch).
    - b. Class 1 fire rating when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less.
    - c. Rated self extinguishing when tested in accordance with ASTM D635.
    - d. Material shall be labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.
    - e. Integral color with all colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.
    - f. Same finish on exposed surfaces.

### **2.2 CORNER GUARDS**

- A. Resilient, Shock-Absorbing Corner Guards: Surface mounted type of 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. Provide appropriate mounting hardware, clips, cushions and base plates as required.
  - 2. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.

### **2.3 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.
- C. Use security-type fasteners where exposed to view.

### **2.4 FINISH**

- A. In accordance with NAAMM AMP 500 series.
- B. Aluminum:

1. Concealed aluminum: Mill finish as fabricated, uniform in color and free from surface blemishes.
- C. Resilient Material: Embossed texture and color in accordance with SAE J 1545 and as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

## **PART 3 - INSTALLATION**

### **3.1 RESILIENT CORNER GUARDS**

- A. Install corner guards on walls in accordance with manufacturer's written instructions. Install units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.
  1. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
    - a. Provide anchoring devices to withstand imposed loads.
    - b. Adjust end and top caps as required to ensure tight seams.
- B. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent, unless the manufacturer recommends a different cleaning agent to be used.
- C. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

--- E N D ---



**SECTION 10 28 00**  
**TOILET, BATH, AND LAUNDRY ACCESSORIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies manufactured items usually used in dressing rooms, toilets, baths, locker rooms and at sinks in related spaces.
- B. Items Specified:
  - 1. Paper towel dispenser.
  - 2. Toilet tissue dispenser.
  - 3. Grab Bars: (10800-1.DWG).
  - 4. Clothes hooks, robe or coat.
  - 5. Metal framed mirror: (10800-7.DWG).
  - 6. Mop racks.
  - 7. Sanitary napkin vendors.
  - 8. Sanitary napkin disposal.
  - 9. Baby changing station.
  - 10. Hand sanitizer dispensers.
  - 11. Under-lavatory guards.
  - 12. Liquid soap dispenser.
- B. This section also specifies custom fabricated items used in toilets and related spaces.

**1.2 RELATED WORK**

- A. Wood blocking: Section 06 10 00, ROUGH CARPENTRY.
- B. Color of finishes: 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. Identify products using designations indicated.
  - 2. Paper towel dispenser.
  - 3. Metal framed mirrors, fillers, and design and installation of units when installed on ceramic tile wainscots and offset surfaces.
  - 4. Grab bars, showing design and each different type of anchorage.
  - 5. Soap dispenser, showing anchorage and components.

6. Show material and finish, size of members, and details of construction, installation and anchorage of mop racks.

7. Sanitary napkin vendor.

8. Baby changing station.

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 / lotion soap or aseptic detergents, PhisoHex and solutions containing hexachlorophene.

2. Anodized finish as specified.

F. Warranty:

1. Special Mirror Warranty: Manufacturer's Standard Form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defect and that fail in materials or workmanship within specified warranty period.

2. Warranty Period: Fifteen (15) Years from Date of Substantial Completion.

G. Maintenance Data.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.5 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.

## **1.6 PACKAGING AND DELIVERY**

- A. Pack accessories individually to protect finish.
- B. Deliver accessories to the project only when installation work in rooms is ready to receive them.
- C. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- D. Deliver products to site in sealed packages of containers; labeled for identification with manufacturer's name, brand, and contents.

## **1.7 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.

## **1.8 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
  - A176-99(R2009).....Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
  - A269-10 .....Seamless and Welded Austenitic Stainless Steel Tubing for General Service
  - A312/A312M-09.....Seamless and Welded Austenitic Stainless Steel Pipes
  - A653/A653M-10.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - B221-08 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
  - B456-03(R2009) .....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

- C1036-06 .....Flat Glass
- F446-85(R2009).....Consumer Safety Specification for Grab Bars and Accessories  
Installed in the Bathing Area.
- D3453-07 .....Flexible Cellular Materials - Urethane for Furniture and  
Automotive Cushioning, Bedding, and Similar Applications
- C. The National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500 Series .....Metal Finishes Manual
- D. American Welding Society (AWS):  
D10.4-86 (R2000).....Welding Austenitic Chromium-Nickel Stainless Steel Piping and  
Tubing
- E. Federal Specifications (Fed. Specs.):  
A-A-3002 .....Mirrors, Glass  
FF-S-107C (2).....Screw, Tapping and Drive  
FF-S-107C .....Screw, Tapping and Drive.  
WW-P-541E(1).....Plumbing Fixtures (Accessories, Land Use) Detail Specification

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Aluminum: ASTM B221, alloy 6063-T5 and alloy 6463-T5.
- B. Stainless Steel:
  - 1. Plate or sheet: ASTM A167, Type 302, 304, or 304L, except ASTM A176 where Type 430 is specified, 0.0299-inch thick unless otherwise specified.
  - 2. Tube: ASTM A269, Alloy Type 302, 304, or 304L.
- C. Stainless Steel Tubing: ASTM A269, Grade 304 or 304L, seamless or welded.
- D. Stainless Steel Pipe: ASTM A312; Grade TP 304 or TP 304L.
- E. Steel Sheet: ASTM A653, zinc-coated (galvanized) coating designation G90.
- F. Glass:
  - 1. ASTM C1036, Type 1, Class 1, Quality q2, for mirrors.
- G. Foam Rubber: ASTM D3453, Grade BD, Type 2.

### **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. AA-M32 Mechanical finish, medium satin.
  - 1. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.
  - 2. Stainless Steel: NAAMM AMP 503, finish number 4.
  - 3. Ferrous Metal:
    - a. Shop Prime: Clean, pretreat and apply one coat of primer and bake.
    - b. Finish: Over primer apply two coats of alkyd or phenolic resin enamel, and bake.

## **2.4 FABRICATION - GENERAL**

- A. Welding, AWS D10.4.
- B. Grind dress, and finish welded joints to match finish of adjacent surface.
- C. Form exposed surfaces from one sheet of stock, free of joints.
- D. Provide steel anchors and components required for secure installation.
- E. Form flat surfaces without distortion. Keep exposed surfaces free from scratches and dents.  
Reinforce doors to prevent warp or twist.
- F. Isolate aluminum from dissimilar metals and from contact with building materials as required to prevent electrolysis and corrosion.
- G. Hot-dip galvanized steel, except stainless steel, anchors and fastening devices.
- H. Shop assemble accessories and package with all components, anchors, fittings, fasteners and keys.
- I. Key items alike.
- J. Provide templates and rough-in measurements as required.
- K. Round and deburr edges of sheets to remove sharp edges.

## **2.5 PAPER TOWEL DISPENSERS**

- A. Owner Furnished, Contractor Installed.

## **2.6 TOILET TISSUE DISPENSERS**

- A. Owner Furnished, Contractor Installed.

## **2.7 GRAB BARS**

- A. Fed. Spec WW-P-541/8B, Type IV, bars, surface mounted, Class 2, grab bars and ASTM F446.
- B. Fabricate of stainless steel with slip-resistant texture in grip area:
  - 1. Stainless steel: Grab bars, flanges, mounting plates, supports, screws, bolts, and exposed nuts and washers.
- C. Concealed mount.
- D. Bars:
  - 1. Fabricate from 38 mm (1-1/2 inch) outside diameter tubing.
    - a. Stainless steel, minimum 1.2 mm (0.0478 inch) thick.
  - 2. Fabricate in one continuous piece with ends turned toward walls.
  - 3. Continuous weld intermediate support to the grab bar.
- 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.

## **2.8 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.

## **2.9 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.

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.
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.

**2.10 MOP RACKS**

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

B. Clamps:

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

C. Support:

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

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

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

**2.11 SANITARY NAPKIN VENDOR**

- A. Type: Sanitary Napkin and Tampon.
- B. Mounting: Semi-recessed.
- C. Capacity: 20 Napkins, 28 Tampons (minimum)
- D. Operation: No Coin (Free)
- E. Exposed Material and Finish: Stainless Steel, number 4 finish (satin).
- F. Lockset: Tumbler type.

**2.12 SANITARY NAPKIN DISPOSER**

- A. Mounting: Wall/Floor
- B. Size: 12-1/2" (h) X 5-1/4" (d) X 10-3/4" (w)
- C. Lid: Tight-fitting.
- D. Liner: Removable rigid liner.
- E. Material: Plastic.

**2.13 BABY CHANGING STATION**

- A. Owner Supplied, Contractor Installed.

**2.14 HAND SANITIZER DISPENSER**

- A. Description: Designed for dispensing hand sanitizer in liquid form.
- B. Mounting: Vertically oriented, surface mounted with backplate.
- C. Quantity: 24, to be installed in locations as directed by the Resident Engineer.

**2.15 UNDERLAVATORY GUARDS**

- A. Description: Insulating pipe covering for supply piping (hot and cold water) and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
- B. Material and Finish: Antimicrobial, molded plastic, white.

**2.16 LIQUID SOAP DISPENSER**

- A. Owner Furnished, Contractor Installed.
- B. Quantity: Provide one at each sink and lavatory.



## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Before starting work notify Resident Engineer in writing of any conflicts detrimental to installation or operation of units.
- B. Verify with the Resident Engineer the exact location of accessories.

### **3.2 INSTALLATION**

- A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Toggle bolt to steel anchorage plates in frame partitions 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. Coordinate exact equipment that is to be Owner Furnished and Contractor Installed with Resident Engineer. Coordinate installation requirements of Owner provided equipment with equipment manufacturer's written installation instructions.
- J. Install grab bars to withstand a downward load of at least 250 lbf (1112N), when tested according to ASTM F446.

### **3.3 SCHEDULE OF ACCESSORIES**

Refer to the Drawings.

### **3.4 CLEANING**

After installation, clean as recommended by the manufacturer and protect from damage until completion of the project.

- - - E N D - - -

**SECTION 10 44 13**  
**FIRE EXTINGUISHER CABINETS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section covers recessed fire extinguisher cabinets.

**1.2 RELATED WORK**

- A. Acrylic glazing: Section 08 80 00, GLAZING.
- B. Color Schedule: Section 09 06 00, SCHEDULE FOR FINISHES
- C. 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.
- C. Maintenance Data.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

- 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**1.4 APPLICATION PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Testing and Materials (ASTM):
  - D4802-10 .....Poly (Methyl Methacrylate) Acrylic Plastic Sheet
  - E814-11a.....Fire Tests of Penetration Firestop Systems

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

### **2.2 FIRE EXTINGUISHER CABINET**

Recessed type with exposed flat trim of size and design shown, suitable for fire extinguisher.

### **2.3 FABRICATION**

- A. Form body of cabinet from 0.9 mm (0.0359 inch) thick sheet steel. One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed rim face and wall return at outer edge (backbend).
- B. Fabricate door and trim from 1.2 mm (0.0478 inch) thick sheet steel with all face joints fully welded and ground smooth. Provide vertical duo panel with frame.
  - 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.

### **2.4 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.

### **2.5 ACCESSORIES**

- A. Identification:
  - 1. Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
    - a. Identify Fire Extinguisher in the fire-protraction cabinet with the word "FIRE EXTINGUISHER".
    - b. Location: Applied to cabinet glazing.
    - c. Application Process: Pressure-sensitive vinyl letters.
    - d. Lettering Color: As selected by the Resident Engineer.
    - e. Orientation: Vertical.

## **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 and that the distance from finish floor to the centerline of the nozzle/handle of the extinguisher is not greater than 1219 mm (48 inches).
- C. Fasten cabinets to structure, square and plumb.
- D. Apply vinyl lettering as indicated.
- E. Adjust fire protection cabinet doors to operate easily without binding.
- F. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touch-up or similar minor repair procedures.

- - - E N D - - -

**SECTION 113100  
RESIDENTIAL APPLIANCES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Section Includes:
  - 1. Cooking appliances.
  - 2. Refrigeration appliances.

**1.2 RELATED WORK**

- A. Section 09 06 00, SCHEDULE FOR FINISHES

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Product certificates.
- C. Warranties: Sample of special warranties.
- D. Operation and maintenance data.

**1.4 SUSTAINABILITY CONSIDERATIONS**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**1.5 WARRANTY**

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace appliances or components that fail in materials or workmanship within specified warranty period.
  - 1. Microwave Oven: Five-year limited warranty for service on defects in magnetron tube.
  - 2. Refrigerator/Freezer: Five-year limited warranty for service on the sealed refrigeration system.

## **PART 2 - PRODUCTS**

### **2.1 MICROWAVE OVENS**

- A. Microwave Oven:
  - 1. Mounting: Countertop.
  - 2. Capacity: 2.0 cu. ft. (0.06 cu. m).
  - 3. Microwave Power Rating: 1200 W.

### **2.2 REFRIGERATOR/FREEZERS**

- A. Refrigerator/Freezer: Two-door refrigerator/freezer with freezer on top and complying with AHAM HRF-1.
  - 1. Type: Freestanding.
  - 2. Storage Capacity:
    - a. Refrigeration Compartment Volume: 12.93cu. ft. (0.37 cu. m).
    - b. Freezer Volume: 5.09 cu. ft. (0.14 cu. m).
  - 3. General Features:
    - a. Interior light in refrigeration compartment.
    - b. Automatic defrost.
    - c. Automatic icemaker and storage bin.
  - 4. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
  - 5. Front Panel(s): Manufacturer's standard.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- B. Utilities: Comply with plumbing and electrical requirements.

--- END ---

**SECTION 123661**  
**SIMULATED STONE COUNTERTOPS**

**PART 1 – GENERAL**

**1.1 DESCRIPTION**

- A. Section Includes:
  - 1. Solid-surface-material countertops and backsplashes.
  - 2. Solid-surface-material for use as window sills.

**1.2 RELATED WORK**

- A. Millwork upon which solid surface countertops are to be installed: Section 06 41 16, PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS.
- B. Color and patterns of solid-surface-material: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Product Data: For solid surface materials.
- B. Shop Drawings:
  - 1. For countertops. Show materials, finishes, edge and backsplash profiles, and methods of joining, and cutouts for plumbing fixtures.
  - 2. For window sills. Show materials, finishes, edge profiles, and methods of joining.
- C. Samples:
  - 1. For each type and color of material exposed to view.
  - 2. 150mm (6-inch) square sample of each color and texture specified.

**1.4 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

**1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below for a part of this specification to the extent referenced.  
Publications are referenced in the text by the basic designation only.
- B. American National Standards Institute (ANSI)
  - 1. ANSI SS1.....Performance Standard for Solid Surface Materials.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- A. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
  - 1. Type: Provide Standard Type unless Special Purpose Type is indicated.
  - 2. Colors and Patterns: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Joint Adhesive: Manufacturer's epoxy type adhesive for joining plastic resin sheets.

### **2.2 SOLID-SURFACE-MATERIAL COUNTERTOPS**

- A. Configuration: Provide countertops with the following front and backsplash style:
  - 1. Front: Beveled (1/4").
  - 2. Side Splash and Back Splash: Straight, slightly eased edges at corner.
- B. Countertops: 3/4-inch- (19-mm-) thick, solid surface material with front edge built up with same material.
- C. Side Splash and Back Splash: 3/4-inch- (19-mm-) thick, solid surface material.
- D. Fabricate from largest sections practicable.
- E. Fabricate with joints flush on top surface.

### **2.3 SOLID-SURFACE-MATERIAL WINDOW SILLS**

- A. Configuration: Provide window sills with the following front style:
  - 1. Front: Full Radius Bullnose.
  - 2. Sides and Back: Straight and square, slightly eased edges at projected portions.
- B. Window Sills: 3/4-inch- (19-mm-) thick, solid surface material.
- C. Fabricate from largest sections practicable.
- D. Fabricate with joints flush on top surface.
- E. Fabricate sills to overhang finished wall surface 19mm (3/4-inch).

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

- A. Before installing countertops, side splashes, back splashes, and window sills, verify the wall surfaces have been finished as specified.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Align adjacent surfaces and, using adhesive in color to match countertops, form



seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

- C. Fasten window sills using adhesive recommended by manufacturer. Adhere per manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match window sills, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

### **3.2 PROTECTION AND CLEANING**

- A. Tightly cover and protect against dirt, water, and chemical or mechanical injury.
- B. Clean at completion of work.

- - - END - - -

**SECTION 12 56 70**  
**INTEGRATED MODULAR MEDICAL SUPPORT SYSTEM**

**PART 1 --GENERAL**

**1.1 DESCRIPTION**

- A. Section includes
  - 1. Furnish all labor, materials, tools, design, equipment and installation services for all components of Integrated Modular Medical Support System (IMMSS) as indicated, in accordance with provisions of the Contract Documents.
  - 2. Fully coordinate work with all other trades.
  - 3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to, or necessary for sound, secure, and complete installation.
  - 4. Forman will be available to supervise the installation of all products under this specification.
  - 5. Provide a clinical systems consultant who shall be available during the design and installation to advise the health care facility representative of appropriate product application at the nurse station. The clinical system consultant must have a degree in Degree in Nursing -- B.S. or Equivalent and a minimum six (6) years working as a Nurse and five (5) years working as a Clinical System Consultant.
  - 6. Final hook-ups of utilities will be the responsibility of the General Contractor.

**1.2 RELATED WORK**

- A. Blocking within Wall Construction: Section 06 10 00, ROUGH CARPENTRY.
- B. Colors and Textures: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Plumbing Equipment: Plumbing Sections, Division 22 – PLUMBING
- D. Electrical Equipment: Electrical Sections, Division 26 - ELECTRICAL

**1.3 SYSTEM DESCRIPTION**

- A. Support components
  - 1. Panel System
  - 2. Horizontal Support elements
  - 3. Vertical Support Elements

- B. Counter Surfaces
  - 1. Work Surfaces
- C. Storage Assemblies
  - 1. Materials Handling Components
  - 2. Shelving Systems (Shelf Storage Units)
  - 3. Filing (Modular Storage)
- D. Nurse Station
- E. Accessory items
  - 1. Display Surfaces.
  - 2. Lighting

#### **1.4 REFERENCES AND QUALITY ASSURANCE**

- A. References
  - 1. National Sanitation Foundation (NSF 30)
  - 2. Building and Institutional Furniture Manufacturers Association (BIFMA)
  - 3. National Electrical Code (NFPA 70-1990)
  - 4. Underwriter's Laboratory (UL)
  - 5. Electrical Testing Laboratory (ETL)
  - 6. American Society for Testing and Materials (ASTM)
- B. Design criteria
  - 1. The intent of this specification is to provide quality and functional interior furnishings for this health care facility. These products should enable the health care facility to avoid product replacement cost and at the same time avoid product obsolescence. The interior furnishings must respect this intent in addition to providing maximum product integration and flexibility to accommodate changing medical technology. The products must have the inherent qualities of durability, aesthetic value, and safety while being most functional within the health care setting.
  - 2. This facility has been designed to be space efficient and permit maximum internal flexibility which will facilitate cost efficient reconfiguration of space and traffic patterns. For example, clinical space may be converted to office space or storage areas.
  - 3. Additionally, a wide selection of components and accessories are required to solve the pharmacy, administrative and material handling requirements. Products must be fully compatible and interchangeable with each other to avoid costly

reconfiguration expenses. All components shall exhibit a high degree of modularity so that components can be used anywhere within the facility. A complete line of products must provide the benefits to the entire organization from the open-station areas of the pharmacy to reception areas. This provides the ability to take a pharmacy area, reuse it for an administrative or clinical function within the pharmacy.

4. System will allow hospital to be space efficient by making maximum use of vertical space and by providing a highly organized and versatile way of storing and transporting materials.
5. All components shall be modular, on 24" and 48" increments and shall be interchangeable with each other together.

C. Source quality control

1. IMMSS manufacturer must have minimum five years' continuous experience in manufacture of all systems components and accessories.
2. Manufacturer furnish proof of successful completion of at least three projects of similar scope within that time; furnish names of projects, scope, and name and telephone number of individual at facility to contact.
3. Furnish proof of financial and technical resources to assure prompt performance in production and delivery.
4. Furnish proof manufacturer produces products specifically designed for functional disciplines of pharmacy, laboratory, ICU, surgery, materials handling, paper and data processing, emergency, receiving, nurses station, recovery, and administration.

## **1.5 SUBMITTALS**

A. Shop drawings

1. Provide complete shop and installation drawings, giving all dimensioning, details of construction, and accessory items.
2. Indicate electrical, mechanical, and telecommunication entry locations.
3. Indicate wall reinforcement and anchorages.
4. Final Drawings
  - a. As built drawings of all spaces products under this specification have been installed shall be provided to the Resident Engineer upon completion of the project.

- B. Product data
  - 1. Provide catalog and model numbers for all components.
  - 2. Provide addresses and phone numbers of nearest stocking/service parts locations.
- C. Samples
  - 1. Provide samples of all fabrics, finishes, and colors as requested by Owner.
  - 2. Provide samples of chemical resistant materials.
- D. Project information
  - 1. Certificates: copies of UL and/or ETL cards on listed components.
- E. Project close-out data
  - 1. Operating and maintenance data
    - a. Provide technical and operational instruction and user's manuals for all components.
    - b. Provide physical demonstration of interchangeability of components.
  - 2. Warranties. See Section 1.9
  - 3. Minimum of two copies of manufacturer's complete catalogs and price lists.
  - 4. Location and phone of nearest service organization.

## **1.6 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
  - 1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.7 DELIVERY STORAGE AND HANDLING**

- A. Deliver all components to site in manufacturer's clearly identified containers with delivery terms being FOB freight prepaid.
- B. Provide for storage of all products in this specification in a secure warehouse until installed.
- C. Time delivery to assure components is available at site when required for installation.

## **1.8 JOB CONDITIONS**

- A. Existing conditions
- B. Protection
  - 1. Assure that adjoining work is not damaged by installation of this work.
  - 2. Provide temporary protection as required, and repair all damage to such work.
- C. Sequencing
  - 1. Coordinate this work with other operations in same area to avoid conflicts.

## **1.9 WARRANTY**

- A. All warranties run from date of Substantial Completion.
- B. Written warranty on entire system, signed jointly by installer, manufacturer, and Contractor, for period of one year.
- C. Written warranty on all system components from manufacturer, for a period of 10 years, with 24-hour-per-day, 7-days-per-week usage.
- D. Written warranty on items incorporated into system, not manufactured by contractor or subcontractor for a period of one year.

## **PART 2 -- PRODUCTS**

### **2.1 MANUFACTURER**

- A. Acceptable manufacturers
  - 1. IMMSS System
    - a. Administrative, Pharmacy, Nurse Station and Material Handling System, by Herman Miller Healthcare, 855 East Main Avenue, PO Box 302, Zeeland, Michigan 49464-0302.
    - b. Other manufacturers desiring approval shall demonstrate compliance of essential characteristics with requirements of this specification.

### **2.2 MODULARITY REQUIREMENTS**

- A. All IMMSS components must be provided by one manufacturer.
  - 1. If products of several manufacturers are used to satisfy this section, then all items shall meet the specified flexibility and interchangeability requirements.
  - 2. Supplier of the system is responsible for performance of all components.
- B. All IMMSS components, except the nurse station, shall be modular, on 24" and 48" increments and shall be interchangeable to form a flexible system which will accommodate change.
  - 1. Dimensions of products are nominal and are located on the appropriate equipment drawings and schedules.

- C. All hanging components must also be modular on same increments.
  - 1. Provide units which are selectively removable and replaceable, without disturbing adjacent components.
  - 2. Modular containers of various sizes to store and to transport medical forms, lab slips, and patient and X-ray charts.

## **2.3 FABRICATION**

### **A. Support Components**

#### **1. Panel System**

##### **a. General Performance Requirements**

- 1) Shall meet class A requirements for flame spread and smoke development as specified by ASTM E-84 and the National Fire Protection Association National Life Safety Code No. 101, except for glazed units.
- 2) Shall have pre-assembled steel hangers with slots at a maximum of one inch intervals for suspension of work surfaces, shelf storage, adapter rails, frame supports and dispensing rails. Panel types to support from a minimum live load weight of 300 pounds up to a maximum live load weight of 1,150 pounds per panel, per side.
- 3) Shall have adjustable leveler glides to provide uniform height assurance for adjacent units on uneven floors, and the capability of easily relocating an entire run of dividers by sliding over the floor without disassembly of dividers and suspended modular counters and shelf storage units.
- 4) Shall be designed to permit installation to begin with any partition in the run. Once erected, any partition can be removed, replaced, or relocated without removing any other partition or without violating the integrity of the panel system.
- 5) Shall be of sufficient width to permit one person to easily carry, skid, transport or relocate with minimum risk of bodily strain or harm.
- 6) Shall be capable of being installed on top of finished flooring without the penetration of the finished floor or the use of floor

- fasteners; shall have complete flexibility for future changes without having to patch floor material.
- 7) Shall have both a powered panel and a non-powered panel. Please see equipment drawings for details.
  - 8) An eight-wire system with three circuits for general purpose power with an extra dedicated circuit to provide a wide range of electrical solutions shall be available.
  - 9) Provide up to four circuits (with possibility of one dedicated line), each with a 20-amp maximum rated load. Total capacity per power entry equals 80 amps.
  - 10) Powered Panels are pre-wired at the factory to save installation time and costs, but power components must be retrofittable in the field.
  - 11) Shall meet the National Electric Code and be UL listed.
  - 12) The electrical channel shall offer an optional metal shielding plate that shields data lines from power lines within the baseline cable management space to reduce the chance of electrical interference or possible tapping of the data lines.
  - 13) The baseline cable management channel shall accommodate at least 20 25-pair cables in a panel with energy and up to 40 without energy to ensure that heavy computerized areas will have adequate space for equipment support.
  - 14) "Top cap" assemblies, requiring extra pieces and installation time to accommodate cable requirements, are not acceptable.
  - 15) The baseline cable management channel shall be plastic to minimize damage from ordinary floor maintenance; e.g. vacuum cleaners, buffers, etc.
  - 16) The baseline cable management channel shall have hinged side covers to provide quick and easy access to electrical harnesses and telecommunications.
  - 17) The cable management shall have a "lay-in" design to eliminate tenuous, time-consuming "fishing through" cables into the panels.



- 18) The electrical system will come with preset circuit receptacles to eliminate individuals from contaminating dedicated line by switching circuits. Electrical systems that contain user-changeable receptacles are not acceptable.
  - 19) Have barrier(s) in the raceway to maintain voice\data isolation from the electrical system shall be provided. If a non-conductive barrier(s) is not provided through the base raceway the offeror must bring this to the attention of the Resident Engineer and provide an acceptable equivalent with the use of an add or an internal top cap raceway to achieve data and electrical isolation.
  - 20) The power system must offer both ceiling access and end of panel access since both wall and ceiling power are available and interior offices must be served by electrical connections in both the ceiling and walls.
  - 21) The electrical system shall be capable of reconfiguration without the need for an electrician.
  - 22) The electrical system shall have as a minimum the capacity for two duplex outlets per panel side to accommodate current electrical needs and eliminate the need for extension cords which create a safety hazard.
- b. Types Required - Please refer to the equipment drawings for specific finishes and sizes.
- 1) Standard panels shall be modular, hard faced units available in a minimum of:
    - a) Three finishes
    - b) Linear
    - c) Five heights from 34" to 80"
    - d) Five widths from 12" to 48"
  - 2) Fabric covered panels shall be modular, and available in a minimum of:
    - a) Hard and acoustic subsurface
    - b) 25 color options
    - c) .80 NRC for acoustic rating
    - d) 22 STC for acoustic rating

- e) Five heights from 34" to 85"
- f) Five widths from 12" to 60"
- 3) Open panels shall be modular, adaptable with accessories to create service chases and available in a minimum of:
  - a) 190 and 400 weight load capability
  - b) Three heights from 48" to 85"
  - c) Five widths from 24" to 48"
- 4) Support panels shall be modular units available in a minimum of:
  - a) Two heights from 48" to 80"
  - b) Two widths from 24" to 48"
  - c) 1,150 pounds live load weight capacity per panel, per side
  - d) Power entry support panels shall be available to allow the routing of both electrical and telecommunications wires to the work surface level from either the floor or the ceiling. This entry wire chase shall be UL listed and have a minimum inside clear dimension of 1 1/2 inches by 4 1/2 inches. It shall be able to be subdivided into two separate raceways to accommodate separation of electrical voltages and/or low-voltage cabling.

c. Hardware

- 1) Connectors shall be made of a material to withstand the weight of loaded components and the stress of movement under loaded conditions. Connectors shall accommodate a variety of panel configurations, including:
  - a) Straight line connection (180 degrees) of two panels
  - b) L connections (90 degrees) of two panels
  - c) T connections (all 90 degrees) of three panels
- 2) Connectors shall be able to connect panels of differing heights. Connector system shall allow continuation of electrical and communications wiring within a work station and from work station to work station. Connectors shall be reusable.
- 3) The finish of all filler post shall have the capability to match the finish and the color of the panel trim.

- 4) Right angle (90 degrees) connections shall not interfere with the capability to hang work surfaces and other components on any adjacent panel
2. Horizontal Support Elements
  - a. Electrical wiring chases
    - 1) A modular, surface-mounted metal raceway system shall be used to provide power and/or low-voltage services. The raceway shall be provided and installed under this section. The electrical contractor shall provide and install all appropriate interior components, wiring, and devices to provide a safe and complete installation. The color of all visible metal parts shall match the supporting structure.
    - 2) Wire chase rail base section shall be a rectangular section 1 3/4" w x 4 3/4" h fabricated out of .050-inch galvanized steel with a painted finish and the work tool rail, which is an integral component, shall be fabricated of .075" thick extruded 6063 T5 aluminum with a painted finish. The wire chase rail shall be attached with hanger clips that are a minimum of 13 gauge cold rolled steel. The Wire chase rail shall be available in six modular widths, from 24 to 96 inches long. The base shall attach to any of the supporting structures without defacing the structures and shall be adjustable up or down on 1-inch increments. The metal raceway shall be UL listed and conform to Federal Specification W-C-582 and the National Electrical Code.
    - 3) The base section shall be able to be subdivided into two equal but separate wiring compartments to facilitate the installation of both power and low-voltage wiring. All WiremoldR G4000 series interior components shall be compatible for use with the base section.
    - 4) The wire capacity shall be either 16 type TW or 21 type THW #12 AWG wires with devices or 14, 25-pair low-voltage cables when the base is not subdivided. When the base is subdivided into two separate raceways, each raceway shall accommodate

either 15 type TW or type THW #12 AWG wires with devices or 7, 25-pair low-voltage cables.

- 5) Wire chase rail covers shall be fabricated out of .040-inch galvanized steel with a painted finish to match the base and in modular lengths to match the base. Covers shall snap into the base and be field changeable. Three different types of covers shall be available: full length without receptacle locations, Type 1 with duplex receptacle covers accessing the top half of the base, and Type 2 with duplex receptacle covers accessing both the top and bottom halves of the base. Covers shall include electrical device holders.

b. Dispensing Rail

- 1) Shall be available in a minimum of two modular widths.
- 2) Shall provide capability to hold small materials handling subdivides on vertical support elements.
- 3) Shall be adjustable vertically in 1" or less increments.
- 4) Material shall be of 16 gauge cold-rolled painted steel, extruded aluminum or fiberboard with laminate and steel connectors.

3. Vertical Support Elements

a. Wall Strips

- 1) Wall strips shall provide for components to be suspended from architectural walls where functional or operational procedure, medical equipment, technological changes, or staff requirements may require 1" vertical height adjustments.
- 2) Wall strips shall be able to accept adapter rails to convert vertical support to horizontal support, and dispensing rails to provide for material dispensing stations.
- 3) Wall strips must be capable of supporting at least 600 pounds of supplies in addition to the empty weight of the work surfaces, storage cabinets, and shelves and lighting fixtures typically used in this project.
- 4) Shall be fabricated of steel.

- 5) Types Required: Wall strips shall be available in a minimum of three lengths from 5' to 7'. Please refer to the equipment drawings for specific finishes and sizes.

#### 4. Storage Units

##### a. General Performance Requirements

- 1) Storage unit's exposed edges shall be finished with a bonded PVC edging or similar material to minimize moisture damage.

##### b. Types Required

###### 1) Overhead Storage Units

- a) Units shall be mounted above the work surface and have sliding laminated safety glass doors.
- b) Units shall come in nominal widths of 30" and 48" and have a nominal depth of 15" and nominal height of 21". Please refer to the equipment drawings for specific finishes and sizes.
- c) The 30" unit shall have a capacity of approximately four cubic feet and a maximum load capacity of 70 pounds.
- d) The 48" unit shall have a capacity of approximately seven cubic feet and a maximum load capacity of 140 pounds.
- e) The unit shall be constructed of high-pressure laminated finished particle board with the bottom being reinforced with 16 gauge cold-rolled steel.
- f) The unit shall permit additional shelves, adjustable in three inch increments.

###### 2) Undercounter Storage Units

- a) Units shall provide at least four cubic feet of storage and a load capacity of approximately 200 pounds.
- b) Units shall provide for space for drawers and shall have an interior adjustable shelf.
- c) Units shall have a nominal size of 25" high, 22" wide and 16" deep. Units shall be constructed of high-pressure laminated finished particle board.
- d) Shall have custom acrylic inserts.

- 3) Specialty Storage Units
- a) Units shall be mounted below the work surface and shall accommodate a left or right hand swing door or specialized shelving and drawers.
  - b) Units shall be of a warp-resistant three-ply 5/8" medium-density particle board with both surfaces bound in melamine or similar material with the back panel being constructed of 18 gauge steel. All edges shall be finished with a bonded polyvinyl chloride (PVC)
  - c) Units shall come in nominal widths of 22" and have a nominal depth of 24" and 30" and nominal height of 25".
  - d) Units shall support a maximum load capacity of 200 pounds.
  - e) Units shall accommodate fixed shelves that are 16", 24" or 30" deep with a raised lip of 3/4" and support 50 lbs on each shelf.
  - f) Units shall accommodate pullout shelves that are 16" and 24" which are equipped with nylon rollers and support 50 lbs on each pullout shelf. Pullout shelves shall be flat or inclined. Pullout shelves shall have a 3/4" raised lip on the front and sides.
  - g) Units shall accommodate box drawers that are a nominal 16" and 24" deep and 4", 8" and 12" high and support 50 lbs, Drawers shall be constructed of a 5/8" thick medium-density particle board with an interior that is finished in melamine or similar finish. Drawer fronts are finished in high-pressure laminate and door pulls are constructed of extruded aluminum.
  - h) Units shall accommodate drawers which hold bottles. These drawers shall be available in 8" and 12" high to provide for different bottle heights. Bottle drawers shall pull out and extend a nominal 17" to gain full access to their contents. At least three adjustable dividers must be provided with each bottle drawer.

B. Counter Surfaces

1. Work Surfaces

- a. Work surfaces shall be manufactured with a warp resistant composition that will provide sufficient weight-bearing capabilities as functionally required. At a minimum, a 24" X 48" cantilevered work surface shall be able to support a load of 40 pounds per square foot with a maximum deflection of 1/200 of its span. All work surfaces shall have self edged impact resistant material (PVC or similar) on exposed edges to prevent damage to other equipment or injury to patients, visitors, and staff.
- b. Work surfaces shall be capable of being suspended from similar width standard panel system modules, pharmacy modules, or vertical supports; or they shall be capable of being suspended from horizontal supports.
- c. Work surfaces shall be capable of being easily relocated and installed without tools at various heights as required by either staff or function.
- d. Work surfaces shall be capable of being "stacked" one on top of another to provide multiple writing or storage surfaces as required.
- e. Work surfaces shall have the capability to suspend and easily change under counter mounted storage assemblies.
- f. Work surfaces shall have leveling adjustment capability so units can be brought into a level position to compensate for wall conditions and excessive weight loads.
- g. Work surfaces shall be standardly available in a minimum of ten nominal widths of 24" - 96" and in depths of 24" and 30". Please refer to the equipment drawings for specific finishes and sizes.
- h. There are many work surfaces that will be custom cut. Please refer to equipment drawings for exact dimensions.
- i. Work surfaces shall be finished with a minimum of .050-inch thick standard grade high plastic laminate on top and high pressure laminate on under surface. On designated work surfaces Chem-Surf, Wilsonart, and resin finishes shall be available. Please refer to the equipment drawings for specific finishes and sizes.
- j. Work surfaces shall be available for clinical/laboratory environments with a backsplash of a minimum 1 1/2" height above surface and be able

to be used with the pharmacy modules without any special adapters or installation tools

- k. Designated work surfaces used in pharmacy procedures shall meet the Heat Resistance Test and the Chemical Resistance Test stated NSF 30. Please refer to the equipment drawings for specific finishes and sizes.
- l. Work surfaces shall have a positive locking support system to eliminate the potential of being accidentally dislodged.
- m. Work surfaces shall provide clearance at rear of surface for electrical, medical equipment, monitoring and CRT cords.
- n. Types Required:
  - 1) General-purpose Work Surfaces shall hang from wall strips, panels, or lab modules. They shall be adjustable at one-inch increments enabling the work station to meet different functional needs. General-purpose work surfaces shall be designed to support suspended components. Certain units shall be available with wire access holes, or with finished back edge for use with open or glazed panels.
  - 2) Heavy-duty Work Surfaces shall support a minimum of 400 lbs and hang from the same components as the standard surfaces and shall be available in plastic laminate, Chem-Surf, or black epoxy surfaces. They shall be available in a minimum of three widths of 48" - 72" wide and three depths of 24" - 36 deep. Please refer to the equipment drawings for specific finishes and sizes.
  - 3) Heavy Duty Storage Work Surface
    - a) Shall be a cantilevered work surface with additional top loading capability as well as under-the-counter storage.
    - b) Shall include a frame adapter to support under the work surface containers.
    - c) Shall come in 24" and 30" depth and 24" through 96" wide and in a laminated or Chem-Surf top. Please refer to the equipment drawings for specific finishes and sizes.
  - 4) Peninsula work surfaces shall be available and shall be supported from panels or other work surfaces. They shall be available in a



squared-edge with a round end or in a rectangular shape. They shall be a nominal 30 - 36 inches deep and 30 inches high and 60" in length with support legs or column.

2. Tables

a. Types Required

- 1) Process tables shall be freestanding work surfaces: mounted on swivel casters with wheel locks for maximum mobility, or on glides.
  - a) Shall be available in nominal sizes from 24" to 36" deep and 48" to 72" long and adjustable from 29" to 38" high in one inch increments. Depending on the width of the table, the support legs must support from four to eight storage frames on the underside of the table.
  - b) Shall be available with stainless steel top. Please refer to the equipment drawings for specific finishes and sizes.

C. STORAGE ASSEMBLIES

1. Materials Handling Components

a. General Performance Requirements

- 1) Components shall be modular, and shall be fabricated with no exterior cracks, crevices, joints, corners, or angles that may facilitate bacteria accumulation.
- 2) Components shall be of uniform density throughout to minimize potential bacteria accumulation.
- 3) Components shall be of integral material throughout and shall be manufactured of thermoplastic, sheet molding compound, ABS resin or similar material. This is required since components are subject to mechanical abuse and, therefore, if not made out of an integral material throughout will promote the growth of bacteria when chipped or punctured.
- 4) Components shall be manufactured in such a fashion to insure consistent color throughout. This requirement maintains an acceptable appearance if the surface is scratched or marred.
- 5) Components to have rounded, exposed surfaces free from sharp edges to prevent injury to patients, visitors, and staff.

b. Types Required:

1) Subcontainers and Dividers:

- a) Dividers to provide a mechanism to organize and store various quantities of small, loose, or irregularly shaped items used in materials processing and distribution functions as well as IV bags and forms. Include subdivider vane.
- b) Units to have smooth edges for safety, and fully accessible rounded corners for manual washing.
- c) Exact sizes to be a function of maximum cubic space utilization as required by shelves and drawers.
- d) Finish to be an integral color throughout to maintain an acceptable appearance if the surface is scratched or marred.
- e) A minimum of nine (9) sizes shall be available. Please refer to the equipment drawings for specific finishes and sizes.

2. Shelving Systems (Shelf Storage Units)

a. General Performance Requirements:

- 1) Shelf Storage Units to have rounded exposed surfaces free from sharp edges to prevent injury to patients, visitors and staff.
- 2) Shelf Storage Units to operate safely under maximum load and can be readily installed, removed, and relocated without disturbing adjacent modular componentry.
- 3) Shelf Storage must be able to attach and be interchangeable on panel systems, wall strips, and lab modules.

b. Types Required:

1) General purpose shelving:

- a) Unit to be available in a minimum of four nominal widths from 2' to 4'. Please refer to the equipment drawings for specific finishes and sizes.
- b) Unit to be available in a minimum of two nominal depths from, including a depth to accommodate a standard 3 ring binder for 8 1/2" x 11" paper and a depth

to accommodate a large binder of approximately 15" x 15".

- c) All units to have door covers available with locks for security and cleanliness. Door shall recede on top of units to allow maximum use of interior cubic space. Covering on door shall be either fabric or vinyl for wet environments.
- d) Selected units to be available without additional hardware to be converted to angled display shelving, with front lip.

c. Filing (Modular Storage)

1) General Performance Requirements

- a) Modular Storage units to be manufactured to provide specific paper/form or clinical supply storage.
- b) Modular Storage units to operate smoothly and freely under maximum load, and be readily installed, removed, and relocated.

2) Types Required

a) Pedestal

- (1) Drawers shall be available in box and file types. Pedestals shall be available with a variety of drawer configurations, including but not limited to a box and file drawer and three box drawers.
- (2) Pedestal shall be as a freestanding pedestal.
- (3) All drawers within a pedestal shall be lockable either by a central lock that controls all pedestals under one work surface or individual keyed lock in each pedestal.

## 2.4 NURSE STATION FABRICATION

A. Modular Frames (Please refer to the equipment drawings for specific finishes and sizes.)

- 1. Frames shall be available in nominal heights of 38", 54", 70", and 86" and widths of 2' to 4' in 6-inch increments. To accommodate the wheelchair patient the frame shall be designed to provide for a work surface height from 29 to 34

inches on 1-inch increments. Worksurface should be at a continuous height from inside to outside with a minimum six (6) inch overhang on the exterior

2. Frames shall be constructed of a minimum of 16-gauge steel tubing with a nominal 2" X 2" cross section to insure structural integrity and safety and shall have plastic floor glides which will adjust vertically at least 1" to accommodate floor variance. They shall be designed in such a fashion to permit all hanging components (work surfaces and shelves) to be adjusted in 1-inch vertical increments. All hanging components must, by design, have an anti-dislodgment feature. Each frame shall have hinged injection-molded or similar extruded PVC wire management baseboard covers accessible on both sides which shall provide locations for electrical outlets and an enclosed raceway for the non-electrical. The hinged covers shall allow for the laying in of non-electrical and eliminate the need to thread wires through the base of the frame and around the corners.
3. Frames shall be firmly secured with metal connectors to one another quickly using a simple hand tool (i.e. screwdriver or wrench) and shall allow for a two-way 90-degree, two-way 135-degree, three-way, four-way or straight line configurations. Frames shall be secured so that light is not transmitted through the connectors.
4. Frames shall be designed to accept at least eight duplex receptacles per frame. A four foot wide by 38" frame must; however, accommodate at least eight duplex receptacles. The frames shall have the capability of being wired with two modular eight-wire, four 20-amp circuit electrical distribution systems of which one circuit shall have the capability of being a completely dedicated circuit. The receptacles shall be located at the baseline, vertically every 8 inches, and work surface level. The entire system must be UL listed. Please refer to the equipment and electrical drawings for specific requirements.
5. The frames shall also have the capability of receiving a hard wired (using 3/8" type MC aluminum cabling) solution with hospital grade receptacles. The frames must accommodate both emergency and non-emergency power in the same frame. The receptacles shall be accessible at the baseline, vertically every 8 inches, and at the work surface. The frame and electrical components shall be UL listed.

6. Frames shall have a wire management system that permits both low-voltage and data telecommunications cabling to be accessible at both sides of the frame at every 8 " increments including the baseline and work surface levels.
  7. Frames shall be designed to accept various sizes of access panels with different finishes and perform different functions (example is an equipment access panel).
  8. Frames shall be designed to permit frames of unequal heights to be connected to one another and capable of being anchored to the floor. Frames shall be removed without disrupting adjacent frames.
  9. Frames shall be designed to accept a variety of work surfaces, including work surfaces at 135 degree corners and counter tops with task and ambient lighting.
  10. Frames shall be designed to accept support rails in five nominal lengths from 24" to 48" wide. These rails are used to support storage units.
  11. Frames shall be capable of receiving a rail to provide horizontal interface capability for large storage units and drawer storage units. Adapting horizontal rail shall be adjustable vertically in 1" or less increments and shall be made of steel or extruded aluminum.
  12. A stacking frame shall be available which will increase the height of an existing frame by a nominal 16" without removing the frame from adjacent componentry. The stacking frame shall be constructed of a minimum of 16 gauge steel and shall be load bearing.
  13. Frames shall be available with pre-attached baseline junction boxes for hard wiring to decrease electrical installation time.
- B. Access Panels (Please refer to the equipment drawings for specific finishes and sizes.)
1. Access panels shall close off the interior and exterior chase of the modular open frame, and shall be available in several sizes and variations to allow maximum accommodation of the nurse station's requirements.
  2. Access panels shall be available in tool-supporting, fabric covered, tackable, wrapcoat. Access panels for the wheelchair access module shall be fabricated from high-pressure .05 inch plastic laminate over 7/8-inch particle board core with hpl backer board on the underneath side. Access panels shall also be available that have a finish that is produced by using the Powder Coated Process (epoxy resin paint with a metal substrate).

3. Access panel shall be easily removed without the need for tools and permit nurse station equipment to be serviced from the outside of the nurse station without interfering with staff personnel utilizing the nurse station.
  4. The equipment access panel shall extend the frames internal space by at least 6" to accommodate monitors and other medical equipment. It shall be constructed of a minimal of .17" thick of high impact polystyrene or similar material which is UL approved.
- C. Modular counter tops (Please refer to the equipment drawings for specific finishes and sizes.)
1. Modular counter tops shall be available in lengths of 12 inches to 96 inches and a width of 16 inches. They shall be fabricated from 1 1/8-inch particle board and shall be covered with .05-inch high-pressure plastic laminate with squared edge. They shall be available in 90 degrees corners, 135 degrees corners and linear.
  2. Modular counter top supports shall be available in lengths to match the individual frame widths. They shall be fabricated from painted steel and shall have two fluorescent fixtures with lamps in each support module to illuminate both sides of the frame. The fixtures shall be pre-wired and separately switched and shall have an acrylic lens cover to diffuse the light. The entire counter top support shall be UL listed and be capable of being connected to an emergency power source. The manufacturer of nurse stations shall be responsible for making electrical connections between each counter section. Final electrical connections to the building source shall be made by the general contractor.
- D. Work surfaces (Please refer to the equipment drawings for specific finishes and sizes.)
1. Work surfaces shall be available in 24- or 30-inch depths and widths from 24 inches to 72 inches. They shall be fabricated from high-pressure .05-inch plastic laminate over 1 1/2-inch particle board core with hpl backer board on the underneath side with squared edge. They shall hang from both sides of the support structures and be adjustable up or down in 1-inch increments. Please refer to the equipment drawings for specific finishes and sizes.
  2. Corner work surfaces shall be available in at least two sizes. They shall be fabricated from high pressure .05-inch plastic laminate over at least 1 1/8-inch particle board core with hpl backer board on the underneath side with squared edge. They shall be hung from both sides of the support structures and be

adjustable up and down in 1-inch increments. The underside of the corner work surface shall be predrilled holes for suspension of keyboard tray.

3. The wheelchair access module ADA work surface shall be extended continuously across the open frame and has a depth of 34 to 40 inches and a width of 48 inches. The work surface shall be fabricated from high-pressure .05-inch plastic laminate over at least 1 1/8-inch particle board core with hpl backer board on the underneath side with squared edge. The edges will be rounded to assist in preventing injury to staff and patients. The work surface shall hang from any of the support structures and be adjustable in 1-inch increments from 29 to 34 inches and shall not extend beyond the countertop.
4. Sink-adaptable work surfaces shall be designed to accommodate single and double-bowl sinks in commonly used sizes. They are used primarily on wall strips, and shall have solid sides and front to conceal plumbing hardware. Each sink-adaptable work surface shall be of Corian®.

E. Storage units (Please refer to the equipment drawings for specific sizes and styles.)

1. Shelving Systems (Shelf Storage Units)

a. General Performance Requirements

- 1) Shelf Storage Units to have rounded exposed surfaces free from sharp edges to prevent injury to patients, visitors and staff.
- 2) Shelf Storage Units to operate safely under maximum load of at least 145 pounds and can be readily installed, removed, and relocated without disturbing adjacent modular componentry.
- 3) Shelf Storage must be able to attach and be interchangeable on panel systems and wall strips.
- 4) All storage components shall be master keyed to provide for the necessary security and loss prevention programs at this facility.

b. Types Required

1) General purpose shelving

- a) Unit to be available in a minimum of four nominal widths from 2' to 4'. Please refer to the equipment drawings for specific finishes and sizes.
- b) Unit to be available in a minimum of two nominal depths from, including a depth to accommodate a standard 3 ring binder for 8 1/2" x 11" paper and a depth

to accommodate a large binder of approximately 15" x 15".

- c) All units to have door covers available with locks for security and cleanliness. Door shall recede on top of units to allow maximum use of interior cubic space. Covering on door shall be either fabric or vinyl for wet environments.
- d) Selected units to be available without additional hardware to be converted to angled display shelving, with front lip.

- 2. Storage units shall be manufactured in a variety of heights, depths, and widths and shall hang from both sides of the support structures and be adjustable up and down in 1-inch increments. Storage units shall include open shelves, equipment physiological monitor shelves, closed storage shelves with lockable doors, patient chart shelves with adjustable dividers, lockable lateral files, and coat bar with shelves.
- 3. A variety of pedestals that are freestanding shall be available to support the medical staff. The drawer fronts on the pedestals must be available in a variety of styles including one design that will support ADA compliance.

F. Storage cabinets (Please refer to the equipment drawings for specific finishes and sizes.)

- 1. Storage cabinets shall be available in heights and widths to match the structural frames and in depths of 18 or 24 inches. They shall be lockable, freestanding, or wall integrated with connectors to hang or attach the cabinet to a frame. Doors are to be recessed into the cabinet and out of the way when open. They shall come complete with leveling glides and adjustable organizing components to allow for the storage of paper, forms, coats, or other items.
- 2. Under storage units shall have the capability of providing open and closed cabinet storage with adjustable shelving, pull out shelving, inclined shelving, and drawers. The unit shelves and doors shall consist of high-pressure laminated finished particle boards. Storage units exposed edges shall be finished with a bonded PVC edging or similar material to minimized moisture damage. Units shall a nominal size of 25" and 28" high, 22" wide, and 16", 24", and 30" deep.
- 3. Overhead storage cabinets shall provide sliding laminated safety glass doors. Units shall be available is a nominal height of 21", a nominal depth of 15", and



nominal widths of 30" and 48". The unit shall be constructed of high-pressure laminated finished particle board with the bottom being reinforced with 16 gauge cold-rolled steel.

4. Freestanding storage. Please refer to the equipment drawings for specific finishes and sizes.
  - a. Freestanding drawer pedestals shall be available in combinations of both 6- and 12-inch-deep drawers. They shall be 19 5/8-inches deep and be fabricated from painted steel with either injection-molded plastic fronts, plastic laminate fronts, wood veneer fronts or painted formed metal fronts.

G. Organizing tools (Please refer to the equipment drawings for specific types and sizes.)

1. A variety of organizing tools shall be available which hang from equipment support tiles without the use of tools. Components shall include diagonal paper trays, horizontal and vertical paper trays, at least three sizes of form trays designed for healthcare forms, shelves, tackboards, day calendars, tape dispensers, card files, document stands, telephone trays and message holders. They shall be adjustable up or down in 1-inch increments without the use of tools.

H. Electrical service --Frames shall be capable of handling a modular pre-wired and a hard wired electrical solution. Review architectural plans and elevations to determine which one is specified and where.

1. Modular electrical distribution system
  - a. Where indicated on the drawings, the frames shall have the capacity of having two modular eight-wire, and four 20-amp circuit electrical distribution systems. One circuit shall have the capacity to be completely dedicated. Duplex or simplex receptacles shall be modular and install without the use of tools. They shall be factory designated to identify which circuit they supply. They shall be capable of being located both at baseline and work surface level.
    - 1) A modular power entry block shall be available to energize the system. It shall have a 6-foot-long 8-wire whip for the general contractor or owner's electrical contractor to connect into the building power supply. The entire system shall be UL listed.

- 2) The wheelchair access module shall provide for the continuity of electrical service across this module.

## I. Accessories

### 1. Display Surfaces

#### a. Performance requirements

- 1) Surfaces shall provide operational areas a convenient mechanism for displaying notices, procedures, policies, schedules, etc.
- 2) Unit shall be capable of being easily relocated and installed without tools at various heights as required by staff or function.

#### b. Types Required

##### 1) Tackboards

- a) Shall be available in several widths and heights.
- b) Shall be fabric covered.
- c) Shall be of various sizes of 24"-48" in width and a nominal height from 1' - 4'.

#### c. Lighting

##### 1) General Performance Requirements

- a) UL listed unit shall provide individual lighting capability to selected location with a minimum of one fluorescent tube.
- b) Unit shall have cord outlet that can be utilized on either right or left side.
- c) Unit shall be easily changed and relocated with the use of tools as needed.
- d) Unit shall have individual on-off switch at convenient location.

##### 2) Types Required

- a) Task lighting shall mount on the underside of shelving and shall be available in a minimum of five widths from 24" - 60", provided with an acrylic diffusing lens to reduce glare and eye fatigue.
- b) LED Light
  - (1) Shall uses two 3.5-Watt LEDs

- (2) Shall have a guarantee long life of at least 60,000 hours
- (3) Shall be a minimum of 40 percent recyclable at the end of its useful life
- (4) Shall be able to adjust the light to a 45-degree angle rotation with a tab adjustment

2. Keyboard Tray

- a. Unit shall be an adjustable keyboard tray that attaches to the underside of counter and/or 24" and 30" deep hanging work surfaces and is used to support detached keyboards.
- b. The tray shall be at least 22 inches wide and 10 inches deep which is sufficient to hold a standard keyboard.
- c. Tray shall consist of a support board and a top surface. The support board shall be .64" –thick particle board with a black melamine top and bottom surface. The top surface shall be of high impact polypropylene or similar material and shall be fitted over the support board. It shall be formed with a contoured front edge for containing the keyboard.
- d. The units arm mechanism shall be a roll form steel, at least 17 3/4 inches long and finished in powder coat, which provides a track in which the arm mechanism can move forward and backwards.
- e. The tilt subassembly shall be constructed of 13 – gauge cold rolled steel and finished in powder coat.
- f. The tray's handle shall be made of steel shank with a textured, black-plastic knob.
- g. The trays up and down adjustments shall be a minimum of 5 3/4 inches; it travel in/out shall be a minimum of 12 1/2 inches; and its tilt shall be 18 degrees.

3. Monitor Post (flat screen monitor arm)

- a. Shall support monitors weighing up to 26 pounds.
- b. Shall be available in three reach length.
- c. Shall permit the monitor to be installed at different heights to suit different environments and users.
- d. Shall provide 100-degree vertical tilt and 180-degree horizontal movement.

- e. Quick-release monitor attachment so screen can be removed in seconds.
- J. Locks and keying.
  - 1. Key all locks alike.
  - 2. Furnish each lock with two keys.

## **2.5 FINISH**

- A. Colors shall be selected from manufacturer's standard line.
- B. Colors may be specified to identify areas for materials management.
- C. Finishes to meet need for infection control.
- D. Components finished with chemical-resistant paint, must show no visible effect when tested in accordance to NSF-30.

## **PART 3--EXECUTION**

### **3.1 INSTALLATION**

- A. Assemble and install all items in strict accord with manufacturer's printed instructions.
  - 1. Anchor all fixed components firmly, square, level, plumb.
- B. Horizontal support elements
  - 1. Install at heights indicated with all tops, shelves, and writing surfaces level within 1/8" across width.
- C. Vertical support elements
  - 1. Install plumb, spaced as indicated on shop drawings.
  - 2. Align slots to assure hanging units are level.

### **3.2 INSPECTION**

- A. Inspect areas in which work is to be performed for acceptability to receive work.
- B. Report all discrepancies to Contractor for correction.
- C. Proceeding with work constitutes acceptance of existing conditions.

- - - END - - -

## **SECTION 13 05 41**

### **SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS**

#### **PART 1 – GENERAL**

##### **1.1 DESCRIPTION:**

- A. Provide seismic restraint in accordance with the requirements of this section in order to maintain the integrity of nonstructural components of the building so that they remain safe and functional in case of seismic event.
- B. Definitions: Non-structural building components are components or systems that are not part of the building's structural system whether inside or outside, above or below grade. Non-structural components of buildings include:
  - 1. Architectural Elements: Facades that are not part of the structural system and its shear resistant elements; cornices and other architectural projections and parapets that do not function structurally; glazing; nonbearing partitions; suspended ceilings; stairs isolated from the basic structure; cabinets; bookshelves; medical equipment; and storage racks.
  - 2. Electrical Elements: Power and lighting systems; substations; switchgear and switchboards; auxiliary engine-generator sets; transfer switches; fire protection and alarm systems; and telephone and communication systems.
  - 3. Mechanical Elements: Heating, ventilating, and air-conditioning systems; plumbing systems; sprinkler systems; steam equipment and components.
  - 4. Transportation Elements: Mechanical, electrical and structural elements for transport systems, i.e., elevators and dumbwaiters, including hoisting equipment and counterweights.

##### **1.2 RELATED WORK:**

- A. Section 07 41 50, COMPOSITE METAL BUILDING PANELS
- B. Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS
- C. Section 09 22 16, NON-STRUCTURAL METAL FRAMING
- D. Section 09 51 00, ACOUSTICAL CEILINGS
- E. Section 14 21 00, ELECTRIC TRACTION ELEVATORS
- F. Division 22, Plumbing Sections.
- G. Division 23, Heating, Ventilation, and Air Conditioning (HVAC) Sections
- H. Division 26, Electrical Sections

##### **1.3 QUALITY CONTROL:**

- A. Shop-Drawing Preparation:

1. Have seismic-force-restraint shop drawings and calculations prepared by a professional structural engineer experienced in the area of seismic force restraints. The professional structural engineer shall be registered in the state where the project is located.
  2. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in the State where project is located.
- B. Coordination:
1. Do not install seismic restraints until seismic restraint submittals are approved by the Resident Engineer.
  2. Coordinate and install trapezes or other multi-pipe hanger systems prior to pipe installation.
- C. Seismic Certification:
1. In structures assigned to IBC Seismic Design Category C, D, E, or F, permanent equipments and components are to have Special Seismic Certification in accordance with requirements of section 13.2.2 of ASCE 7 except for equipment that are considered rugged as listed in section 2.2 OSHPD code application notice CAN No. 2-1708A.5, and shall comply with section 13.2.6 of ASCE 7.

#### **1.4 SUBMITTALS:**

- A. Submit a coordinated set of equipment anchorage drawings prior to installation including:
1. Description, layout, and location of items to be anchored or braced with anchorage or brace points noted and dimensioned.
  2. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, welds etc. clearly identified and specified.
  3. Numerical value of design seismic brace loads.
  4. For expansion bolts, include design load and capacity if different from those specified.
- B. Submit prior to installation, a coordinated set of bracing drawings for seismic protection of piping, with data identifying the various support-to-structure connections and seismic bracing structural connections, include:
1. Single-line piping diagrams on a floor-by-floor basis. Show all suspended piping for a given floor on the same plain.
  2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).

3. Pipe contents.
  4. Structural framing.
  5. Location of all gravity load pipe supports and spacing requirements.
  6. Numerical value of gravity load reactions.
  7. Location of all seismic bracing.
  8. Numerical value of applied seismic brace loads.
  9. Type of connection (Vertical support, vertical support with seismic brace etc.).
  10. Seismic brace reaction type (tension or compression): Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.
- C. Submit prior to installation, bracing drawings for seismic protection of suspended ductwork and suspended electrical and communication cables, include:
1. Details illustrating all support and bracing components, methods of connection, and specific anchors to be used.
  2. Numerical value of applied gravity and seismic loads and seismic loads acting on support and bracing components.
  3. Maximum spacing of hangers and bracing.
  4. Seal of registered structural engineer responsible for design.
- D. Submit design calculations prepared and sealed by the registered structural engineer specified above in paragraph 1.3A.
- E. Submit for concrete anchors, the appropriate ICBC evaluation reports, OSHPD pre-approvals, or lab test reports verifying compliance with OSHPD Interpretation of Regulations 28-6.

### **1.5 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.
1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## 1.6 APPLICABLE PUBLICATIONS:

- A. The Publications listed below (including amendments, addenda revisions, supplements and errata) form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
  - 355.2-07 Qualification for Post-Installed Mechanical Anchors in Concrete and Commentary
- C. American Institute of Steel Construction (AISC):
  - Load and Resistance Factor Design, Volume 1, Second Edition
- D. American Society for Testing and Materials (ASTM):
  - A36/A36M-08 Standard Specification for Carbon Structural Steel
  - A53/A53M-10 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - A307-10 Standard Specification for Carbon Steel Bolts and Studs; 60,000 PSI Tensile Strength.
  - A325-10 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  - A325M-09 Standard Specification for High-Strength Bolts for Structural Steel Joints [Metric]
  - A490-10 Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
  - A490M-10 Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric]
  - A500/A500M-10 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
  - A501-07 Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
  - A615/A615M-09 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  - A992/A992M-06 Standard Specification for Steel for Structural Shapes for Use in Building Framing
  - A996/A996M-09 Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement



E488-96(R2003)          Standard Test Method for Strength of Anchors in Concrete and  
Masonry Element

- E. American Society of Civil Engineers (ASCE 7) Latest Edition.
- F. International Building Code (IBC) Latest Edition
- G. VA Seismic Design Requirements, H-18-8, February 2011
- H. National Uniform Seismic Installation Guidelines (NUSIG)
- I. Sheet Metal and Air Conditioning Contractors National Association  
(SMACNA): Seismic Restraint Manual - Guidelines for Mechanical Systems, 1998  
Edition and Addendum

## **1.7 REGULATORY REQUIREMENT:**

- A. IBC 2006.
- B. Exceptions: The seismic restraint of the following items may be omitted:
  - 1. Equipment with  $I_p=0$ .
  - 2. Piping in equipment rooms less than 1-1/4 inches inside diameter.
  - 3. All other piping less than 2 ½ inches inside diameter, except for automatic fire suppression systems.
  - 4. All piping suspended by individual hangers, 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.
  - 5. All electrical conduits, less than 2-1/2 inches inside diameter.
  - 6. All rectangular air handling ducts less than six square feet in cross sectional area.
  - 7. All round air handling ducts less than 28 inches in diameter.
  - 8. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of support for the hanger.

## **PART 2 – PRODUCTS**

### **2.1 STEEL:**

- A. Structural Steel: ASTM A36/A36M and A992/A992M.
- B. Structural Tubing: ASTM A500, Grade B.
- C. Structural Tubing: ASTM A501.
- D. Steel Pipe: ASTM A53/A53M, Grade B.
- E. Bolts & Nuts: ASTM A307, A325, A325M, A490, and A490M.

### **2.2 CAST-IN-PLACE CONCRETE:**

- A. Concrete: 28 day strength,  $f'_c = // 25 \text{ MPa (3,000 psi) } // 30 \text{ MPa (4,000 psi) } // xx \text{ MPa } 5000 \text{ psi}$
- B. Reinforcing Steel: ASTM A615/615M or ASTM A996/A996M deformed.

## **PART 3 – EXECUTION**

### **3.1 CONSTRUCTION, GENERAL:**

- A. Provide equipment supports and anchoring devices to withstand the seismic design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.
- B. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.
- C. Construct seismic restraints and anchorage to allow for thermal expansion.
- D. Testing Before Final Inspection:
  - 1. Test 10-percent of anchors in masonry and concrete per ASTM E488, and ACI 355.2 to determine that they meet the required load capacity. If any anchor fails to meet the required load, test the next 20 consecutive anchors, which are required to have zero failure, before resuming the 10-percent testing frequency.
  - 2. Before scheduling Final Inspection, submit a report on this testing indicating the number and location of testing, and what anchor-loads were obtained.

### **3.2 EQUIPMENT RESTRAINT AND BRACING:**

- A. See drawings for equipment to be restrained or braced. Refer to schedules for Importance Factor.

### **3.3 MECHANICAL DUCTWORK AND PIPING; ELECTRICAL CONDUITS, AND TELECOMMUNICATION CABLE TRAYS**

- A. Support and brace mechanical ductwork and piping; electrical conduits; and telecommunication cable trays to resist directional forces (lateral, longitudinal and vertical).
- B. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which will not displace sufficiently to damage adjacent or connecting equipment, or building members.
- C. Seismic Restraint of Piping:
  - 1. Design criteria:
    - a. Piping resiliently supported: Restrain to support 120-percent of the weight of the systems and components and contents.
    - b. Piping not resiliently supported: Restrain to support 60-percent of the weight of the system components and contents.

- D. Piping Connections: Provide flexible connections where pipes connect to equipment. Make the connections capable of accommodating relative differential movements between the pipe and equipment under conditions of earthquake shaking.

### **3.4 PARTITIONS**

- A. In buildings with flexible structural frames, anchor partitions to only structural element, such as a floor slab, and separate such partition by a physical gap from all other structural elements.
- B. Properly anchor masonry walls to the structure for restraint, so as to carry lateral loads imposed due to earthquake along with their own weight and other lateral forces.

### **3.5 CEILINGS AND LIGHTING FIXTURES**

- A. At regular intervals, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls.
- B. Independently support and laterally brace all lighting fixtures. Refer to applicable portion of lighting specification, Section 26 51 00, INTERIOR LIGHTING.

### **3.6 FACADES AND GLAZING**

- A. Do not install concrete masonry unit filler walls in a manner that can restrain the lateral deflection of the building frame. Provide a gap with adequately sized resilient filler to separate the structural frame from the non-structural filler wall.
- B. Tie brick veneers to a separate wall that is independent of the steel frame as shown on construction drawings to ensure strength against applicable seismic forces at the project location.
- C. Install attachments to structure for all façade materials as shown on construction drawings to ensure strength against applicable seismic forces at the project location.

### **3.7 STORAGE RACKS, CABINETS, AND BOOKCASES**

- A. Install storage racks to withstand earthquake forces and anchored to the floor or laterally braced from the top to the structural elements.
- B. Anchor medical supply cabinets to the floor or walls and equip them with properly engaged, lockable latches.
- C. Anchor filing cabinets that are more than 2 drawers high to the floor or walls, and equip all drawers with properly engaged, lockable latches.
- D. Anchor bookcases that are more than 30 inches high to the floor or walls, and equip any doors with properly engaged, lockable latches.

---END---

**SECTION 14 21 00**  
**ELECTRIC TRACTION ELEVATORS**

**PART 1 GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the engineering, furnishing and installation of complete and ready for operation electric traction elevator systems 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. All passenger elevators shall be overhead gearless traction type; with Variable Voltage Variable Frequency (VVVF) microprocessor based control system with regenerative drive, duplex selective collective automatic and 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 and services of proposed manufacturers, suppliers and installers and shall be contingent upon submission by Contractor of certificates 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 shall be submitted 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 do not

have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.

- D. All electric traction 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. Certificates shall 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.
- G. Electrical work shall be performed by Licensed Electricians as requirements by NEC. Certificates shall be submitted for all workers employed in this capacity.

#### **1.4 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date contract is signed.
- B. Federal Specifications (Fed. Spec.):
  - J-C-30B ..... Cable and Wire, Electrical (Power, Fixed Installation)
  - W-C-596F ..... Connector, Plug, Electrical; Connector, Receptacle, Electrical
  - W-F-406E ..... Fittings for Cable, Power, Electrical and Conduit, Metal,  
Flexible
  - HH-I-558C ..... Insulation, Blankets, Thermal (Mineral Fiber, Industrial Type)
  - W-F-408E ..... Fittings for Conduit, Metal, Rigid (Thick- Wall and Thin-wall  
(EMT) Type)
  - RR-W-410 ..... Wire Rope and Strand
  - TT-E-489J ..... Enamel, Alkyd, Gloss, Low VOC Content
  - QQ-S-766 ..... Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet and Strip
- C. International Building Code (IBC)
- D. American Society of Mechanical Engineers (ASME):
  - A17.1 ..... Safety Code for Elevators and Escalators
  - A17.2 ..... Inspectors Manual for Electric Elevators and Escalators
- E. National Fire Protection Association:
  - NFPA 13 ..... Standard for the Installation of Sprinkler Systems

- NFPA 70.....National Electrical Code (NEC)
- NFPA 72.....National Fire Alarm and Signaling Code
- NFPA 101.....Life Safety Code
- NFPA 252.....Fire Test of Door Assemblies
- F. American Society for Testing and Materials (ASTM):
  - A109/A109M-08.....Steel, Strip, Carbon (0.25 maximum percent), Cold-Rolled.
  - A1008/A1008M-09.....Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength  
Low-Alloy and High Strength Low-Alloy with Improved  
Farability
  - C612.....Mineral Fiber Block and Board Insulation
  - E84-12.....Surface Burning Characteristics of Building Materials.
  - E1042-02.....Acoustically Absorptive Materials Applied by Trowel or Spray
- G. Society of Automotive Engineers, Inc. (SAE)
  - J517-91.....Hydraulic Hose, Standard
- H. Gauges:
  - For Sheet and Plate: U.S. Standard (USS)
  - For Wire: American Wire Gauge (AWG)
- I. American Welding Society (AWS):
  - D1.1.....Structured Welding Code Steel
- J. National Electrical Manufacturers Association (NEMA):
  - LD-3.....High-Pressure Decorative Laminates
- K. Underwriter's Laboratories (UL):
  - 486A.....Safety Wire Connectors for Copper Conductors
  - 797 .....Safety Electrical Metallic Tubing
- L. Institute of Electrical and Electronic Engineers (IEEE)
- M. 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. Hoisting machines, controllers, power conversion devices, governors, and all other components located in control room.
  - b. Car, counterweight, supporting beams, guide rails, brackets, buffers, size of car platform, car frame members, 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 car and counterweight.
  - g. Location of shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the control 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. Hoisting Machine.
  2. Hoisting Machine Motor, HP and RPM ratings, Voltage, Starting and Full Load Ampere, and Number of Phases.
  3. Controller
  4. Starters and Overload Current Protection Devices.
  5. Car Safety Device; maximum and minimum rated loads and rated speeds.
  6. Governor
  7. Electric Door Operator; HP and RPM ratings, Voltage and Ampere rating of motor.
  8. Hoistway Door Interlocks.
  9. Car and Counterweight Buffers; maximum and minimum rated loads, maximum rated striking speed and stroke.
  10. Hoist and Compensation Ropes; ultimate breaking strength, allowable working load, and actual working load.
  11. 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 traction hoisting machines.
- H. Dimensioned drawings showing details of:
1. All signal and operating fixtures.
  2. Car and counterweight roller guides.
  3. Hoistway door tracks, hangers, and sills.
  4. Door operator, infrared curtain units.
  5. Fall protection elements, top of cab.
- I. Drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

#### **1.6 SUSTAINABILITY CONSIDERATIONS:**

- A. This project is designed and constructed with practices and procedures to meet the project's sustainability considerations and goals. These considerations and goals are to establish a facility which maximizes sustainability, profitability, and the health of all occupants. In order to fulfill

these goals, this project is pursuing a Green Building Institute's Green Globes™ certification of Two Globes. Refer to sections listed below for sustainability considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS for GREEN GLOBES™ CERTIFICATION.

## **1.7 WIRING DIAGRAMS**

- A. Provide three complete sets of field wiring and straight line wiring diagrams showing all electrical circuits in the hoistway, control room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator control 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 thirty (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 control room no later than six months prior to the expiration of the warranty period.

## **1.8 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. 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 Resident Engineer.

## **1.9 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. Coordinate final installed location with Resident Engineer.

## **1.10 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 three (3) 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. Elevator control system shall be capable of starting the car without noticeable "roll-back" of hoisting machine sheave, regardless of load condition in car, location of car, or direction of travel.
- 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 control 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.

## **1.11 WARRANTY**

- A. Submit all labor and materials furnished in connection with elevator system and installation to terms of "Warranty of Construction" articles of General Conditions. 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 Resident Engineer, 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 Federal Specification 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 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, starting and full load 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 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. Elevators are to be provided with keys that are keyed to match the existing elevators located within the existing hospital building (Building 170). 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. Service box: Provide a single key service box with toggle switches located within. No key switches within.
- H. If the elevator equipment to be installed is not known to the Resident Engineer, the Contractor shall submit drawings in triplicate for approval to the Resident Engineer, Contracting Officer, and VA CFM Elevator Engineer showing all details and demonstrate that the equipment to be installed is in strict accordance with the specifications.

## 2.3 CAPACITY, SIZE, SPEED, AND TRAVEL

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

| ELEVATOR SCHEDULE         |   |
|---------------------------|---|
| Elevator Number           | All Elevators   |
| Overall Platform Size     | 5'-9" wide x 9'-0" front/back (Clear Interior Dimensions) |
| Rated Load – kg (lb)      | 5,000 ;lbs - AIA  |
| Contract Speed - m/s(fpm) | 200 FPM   |
| Total Travel              | 17'-0"  |
| Number of Stops           | 2   |
| Number of Openings        | 2   |
| Type of Roping            | 1 : 1   |
| Entrance Type and Size    | 4'-0" wide x 7'-0" tall, 2 Speed Side Opening             |

## **2.4 POWER SUPPLY**

- A. For power supply in each control room, see Specification 26 05 21, Electrical specifications, 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 control room at the strike side of the control 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 installed in the hoistway and to the controller and between similar apparatus in the elevator control room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than 3/8 inch electrical trade size may be used, not exceeding 18 inches in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.
- B. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or boxes by terminal fittings having an insulated opening for the conductors.
- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used. All fittings shall be steel or malleable iron.
- D. Connect motor or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.
- E. Conduit, junction boxes, outlet boxes, etc., shall be sized for future travel requirements of one additional floor at the Substance Abuse Building.

## **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 conduit and wiring between control room, hoistway and fixtures.
- 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 conductor is not given, voltage and amperes shall not exceed limits set 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.
- E. Controller shall be provided with wiring and components for additional future travel of 1 floor and approximate 15 feet of travel at the Substance Abuse Building.

## **2.9 MICROPROCESSOR CONTROL SYSTEM**

- A. Provide a microprocessor based system with absolute position/speed feedback encoded tape to control the hoisting machine and signal functions in accordance with these specifications. 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 metal cabinets with lockable, hinged door(s) and shall be provided with a means of ventilation. All non-conducting metal parts in the control 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 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 voltage 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 VVVF AC MOTOR CONTROL WITH REGENERATIVE DRIVE**

- A. Variable Voltage Variable Frequency Motor Control:
  - 1. Elevator control shall be affected by means of a compact solid state motor control unit for each and every elevator with electrical characteristics to suit the power supply. The system shall consist of the necessary three phase, full-wave bridge rectifiers and be equipped with regenerative drive.
  - 2. Solid state motor control unit shall operate with high efficiency and low power consumption, have the capacity to handle peak currents typical of elevator service and contain a balanced, coordinated fault protection system which shall accomplish the following:
    - a. Protect the complete power circuit and specifically the power semi-conductors from failure under short circuit (bolted fault) conditions.
    - b. Protect against limited faults arising from partial grounds, partial shorts in the motor armature or in the power unit itself.
    - c. Protect the drive motor against sustained overloads. A solid state overload circuit shall be used.
    - d. Protect motor and power unit against instantaneous peak overload.
    - e. Provide semi-conductor transient protection.
    - f. Provide phase sequence protection to insure incoming line is phased properly.

- g. Removable printed circuit boards shall be provided for the VVVF control. Design tabs so boards cannot be reversed.

## **2.11 AUXILIARY POWER OPERATION**

- A. The control system for all elevators 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. Not more than one elevator at a time in each group 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 cars in group have returned to designated floor, one elevator in each group shall be designated for automatic operation. Individual cars in each group shall restart at 5 second intervals.

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 shall operate on auxiliary power operation.
  - 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 switch for selecting the elevators shall be toggle or rotary type 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.

## **2.12 DUPLEX SELECTIVE COLLECTIVE AUTOMATIC OPERATION**

- A. Provide duplex selective collective automatic operation, for all passenger elevators.

- B. Operate elevators from push buttons inside the cars and located at each and every 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 the 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 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 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 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 corridor call button circuit failure, elevators are to service each floor in both directions in a predetermined pattern without registration of a call within the elevators. Provide illuminated signal in each the 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 lights and outlets on top and bottom of car shall not be interrupted.

### **2.13 LOAD WEIGHING**

- A. Provide means for weighing car load for each and every elevator. When load in a car reaches an adjustable predetermined level of the rated capacity, that car shall bypass registered landing calls until the load in the car drops below the predetermined level. Calls bypassed in this manner shall remain registered for the next car. The initial adjustment of the load weighing bypass setting shall be 60 to 100 percent.

### **2.14 ANTI-NUISANCE FEATURE**

- A. If weight in the car is not commensurate with the number of registered car calls, cancel car calls. Systems that employ either load weighing or door protective device for activation of this feature are acceptable.

### **2.15 FIREFIGHTERS' SERVICE**

- A. Provide Firefighters' Service as per ASME A17.1 Section 2.27.
- B. Smoke Detectors:
  - 1. Smoke detection devices that are designated for actuation of Elevator Phase I "FIRE SERVICE" response in each elevator lobby, top of hoistway, and control 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. Control room smoke detectors shall activate fire recall for each and every elevator with equipment located in that control 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.

### **2.16 SEISMIC REQUIREMENTS**

- A. Meet the requirements of ASME A17.1 Section 8.4, Elevator Safety Requirements for Seismic Risk Zone 2 or greater and VA Seismic Design Manual H-18-8. Refer to Structural Drawings for Seismic Design Criteria.

- B. Support and maintain hoisting machines, controllers, supervisory panels, governors, pit sheaves, car and counterweight rails and brackets, conduit systems, buffers, and compensation sheaves in place to prevent any component from sliding, rotating, overturning, or jumping under conditions imposed by seismic forces not less than that required to produce an acceleration of gravity horizontally and 1/2 gravity vertically acting simultaneously. Design the total system to continue operation without interruption under specified seismic acceleration, as outlined in H-18-8.
- C. Support all vertical conduits or duct systems within the hoistway at points above the center of gravity of the riser. Provide lateral guides at regular intervals.
- D. Provide hoisting machines mounted on vibration isolators with separate isolated seismic restraints.
- E. Controllers and supervisory panel shall be bolted to the floor, and provided with sway braces at the top. Secure all electrical components within the panels to the panel frame. Fit cabinet doors with positive locking latches.
- F. Car and counterweight guide rail brackets and rail clip bolts shall be guarded against snagging the traveling cables on the side of the rail adjacent to the point of suspension of the traveling cables.
- G. Provide car guide rails with at least one intermediate bracket between brackets located at each floor so that bracket spacing does not exceed 2440 mm (8 ft). If intermediate brackets cannot be installed because of lack of structural support, reinforce rails with 229 mm (9 in.) channel or approved equal backing.
- H. Guide rails shall not be less than 22.5 kg/m (15 lb/ft).
- I. Provide counterweight guide rails with intermediate brackets in sufficient number so that the counterweight frame shall span no less than two brackets in its full length anywhere in the hoistway. Each pair of intermediate brackets as well as brackets located at each floor line shall have a horizontal tie of sufficient strength to contain the counterweight. Locate the horizontal tie member between the counterweight and the elevator car, and do not attach to the car guide rail or channel backing.
- J. Provide two counterweight derailment sensing wires vertically on the car side of the counterweight the entire height of travel. The counterweight frame shall be equipped with four derailment rings. Provide counterweight displacement switch. In the event the switch is activated, the corresponding elevator shall stop immediately and then proceed in the direction away from the counterweight to the next floor at a speed not exceeding 0.76 m/s (150 FPM). Upon arrival at the next floor, the elevator shall shut down with its door open. An indicator pilot light shall illuminate when the counterweight derailment detector is activated. This pilot shall be fully identified and shall be located in the control room indicator panel, or if no control room indicator



panel is specified, locate pilot light in a conspicuous place on the front of the elevator controller, not obstructed by controller door panels.

- K. Provide seismic switch to activate seismic operation, a minimum of one seismic switch per elevator or group of elevators.
- L. Provide an Annunciator in control room connected to the essential electrical system. Annunciator will indicate if the seismic switch is not operative due to loss of power.
- M. Provide a sensor switch, installed on the governor rope tail sheave, to signal when the governor tail sheave is dislodged. The sensor shall prevent car movement when the governor tail sheave is dislodged from its normal position.
- N. The stresses in parts of structural members made of steel shall not exceed 88 percent of the minimum elastic strength of the material used in the fastenings.
- O. Provide car enclosure ceiling panels and fluorescent tubes with latching devices that shall restrain the panels and fluorescent tubes. Devices shall be readily removable for cleaning or replacing panels and re-lamping.
- P. Submittals are required for all equipment anchors, supports, restraints and detectors. Submittals shall include weight, dimensions, center of gravity, standard connections, calculations, manufacturer's recommendations, behavior problems (vibration, thermal, expansion, etc.) so that design can be properly reviewed.

## **2.17 ELEVATOR MACHINE BEAMS**

- A. Overhead beams shall meet the requirements of ASME A17.1 Section 2.9 to support machines and machinery in place to prevent any part from becoming loose or displaced under the conditions imposed in service. Machine beams shall be designed as follows:
  - 1. The load resting on the beams and supports shall include the complete weight of the machine, sheaves, controller, governor, and any other equipment, together with the portion of the control room floor supported by the beams.
  - 2. Two times the sum of the tensions in all wire ropes supported by the beams with rated load in the car.

## **2.18 GEARLESS AND GEARED TRACTION MACHINE**

- A. Gearless Traction Hoist Machine:
  - 1. Gearless traction machine with an AC motor, brake, drive sheave, and deflector sheave mounted in proper alignment on an isolated bedplate.
  - 2. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
  - 3. Armature must be electrically balanced and together with motor coupling and brake, mechanically balanced.

4. The structural design of the motor shall insure perfect alignment of bearings. The rotating elements shall be dynamically balanced to minimize vibration.
5. Hoist machine shaft shall be supported by two bearings mounted on a bedplate or integral with machine frame. Shaft shall be of forged steel or close grain electric furnace cast steel.
6. Drive sheaves shall be free from cracks, sand holes, and other imperfections that would tend to injure the hoist belt. Sheave shall be turned smooth and true with belt grooves of proper design to insure maximum traction and maximum life of the hoist belts. Traction sheave shall be mechanically coupled to the hoist motor shaft centered in a positive manner.
7. Hoisting machine brake shall be drum or disc type and shall have the capacity to hold the elevator with 125 percent of rated load. Arrange brake circuits so that no current shall be applied to the brake coil prior to the establishment of the hoistway door interlock circuit, except during leveling, re-leveling, and hoistway access operation.
8. Provide machine bedplate mounted deflector sheaves or supporting steel beams and fastenings to mount deflector sheaves to building structure. Provide minimum 16-gauge easily removable sound insulated sheet metal panels in hoistway wall opening around machine.
9. Provide ladders and platforms with handrails and toe boards for overhead sheave access within the bounds of the control room.

## **2.19 HOIST BELTS**

- A. Provide elevator with the required number and size of belts to insure adequate traction for the range of loads with a factor of safety not less than that required by ASME A17.1 Section 2.20.
- B. Securely attach a corrosion resistant metal data tag to one hoisting belt fastening on top of the elevator.
- C. Provide wedge type shackles.

## **2.20 GOVERNOR ROPE**

- A. Governor Rope shall be 6 x 19 or 8 x 19 wire rope, preformed traction steel, uncoated, fiber core, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 0.375 inch having a minimum safety factor of 5. Tiller rope construction is not acceptable.
- B. Under normal operation rope shall run free and clear of governor jaws, rope guards, and other stationary parts.
- C. Securely attach governor rope tag to governor rope releasing carrier. Data tag shall be corrosion-resisting metal and bear data as required by ASME A17.1 Section 2.18.

## **2.21 SPEED GOVERNOR**

- A. Provide Centrifugal type car driven governor, in accordance with ASME A17.1 Section 2.18, to operate the car safety device and counterweight governor to operate the counterweight safety device. Governor shall be complete with weighted pit tension sheave, governor release carrier and mounting base with protected cable sleeves.
- B. Furnish overspeed switch and speed reducing switches when required.
- C. The governor rope clamping device shall be designed so that no appreciable damage to or deformation of the governor rope shall result from the stopping action of the device in operating the safety.
- D. Provide anti-friction metal bearings for the governor and pit tension sheaves. Bearing shall be either self-oiling or Zerk fitting type connections. Ball or roller bearings may be used in lieu of sleeve type.
- E. Provide metal guard over top of governor rope and sheaves.
- F. Governor, with the exception of finished surfaces, screw threads, etc., shall be factory painted and shall operate freely. Field painting of governor parts shall be permitted in accordance with ASME A17.1 Rule 2.18.3.1.
- G. Where the elevator travel does not exceed 100 feet, the weight tension sheave may be mounted on a pivoted steel arm in lieu of operating in steel guides.

## **2.22 CAR SAFETY DEVICE**

- A. Provide "Type B Safeties" on the elevator that meet the requirements of ASME A17.1 Section 2.17.
- B. Field testing of car safety and governor shall be as specified in Section 3.7 PRETEST and TEST of this specification.

## **2.23 ASCENDING CAR OVERSPEED PROTECTION**

- A. Provide a device to prevent ascending over speed and unintended motion away from the landing when the doors are not locked in accordance with ASME A17.1 Section 2.19.

## **2.24 CAR AND COUNTERWEIGHT BUFFERS**

- A. Provide a minimum of two buffers for each car and one for each counterweight that meet the requirements of ASME A17.1 Section 2.22. Securely fasten buffers and supports to the pit channels and in the alignment with striker plates on car and counterweight. Each 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 2.4.2.
- C. Furnish pipe stanchions and struts as required to properly support the buffer.

## **2.25 COUNTERWEIGHTS**

- A. Elevator shall be counterweighted with the weight of the car plus 40-50 percent of the rated capacity load as required by the controller manufacturer.
- B. Furnish two (2) tie rods with cotter pins and double nuts at top and bottom. Install counterweight retainer plates or other approved means on tie rods to prevent counterweight sub-weights from jumping and/or rattling. Both ends of tie-rods shall be visible and accessible.
- C. Provide counterweight guards in the pit in accordance with ASME A17.1 Section 2.3.

## **2.26 CAR AND COUNTERWEIGHT ROLLER GUIDES**

- A. Provide car and counterweight with adjustable roller guides.
- B. Each guide shall be of an approved type consisting of not less than three (3) wheels, each with a durable, resilient oil-resistant material tire rotating on ball bearings having sealed-in lubrication. Assemble rollers on a substantial metal base and mount to provide continuous spring pressure contact of all wheels with the corresponding rail surfaces under all conditions of loading and operation. Secure the roller guides at top and bottom on each side of car frame and counterweight frame. All mounting bolts shall be fitted with nuts, flat washers, split lock washers, and if required, beveled washers.
- C. Provide sheet metal guards to protect wheels on top of car and counterweight.
- D. Minimum diameter of car rollers shall be 150 mm (6 in.) unless the six wheel roller type is used. The entire elevator car shall be properly balanced to equalize pressure on all guide rollers. Cars shall be balanced in post-wise and front-to-back directions. Test for this balanced condition shall be witnessed at time of final inspection.
- E. Minimum diameter of counterweight rollers shall not be less than 75 mm (3 in.). Properly balance counterweight frame to equalize pressure on all guide rollers. The Contractor shall have the option of furnishing, for counterweight only, mechanically adjusted roller guide in lieu of spring loaded roller guides as specified.
- F. Equip all cars and counterweight with an auxiliary guiding device for each guide shoe which shall prevent the car or counterweight from leaving the rails in the event that the normal guides are fractured. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. Fabricate the auxiliary guides from hot rolled steel plate and mount between the normal guide shoes and the car and counterweight frames. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide which shall come in contact with the rail guiding surfaces in the event of loss of the normal guides shall be lined with an approved bearing material to minimize damage to the rail guiding surfaces.

## **2.27 GUIDE RAILS, SUPPORTS AND FASTENINGS**

- A. Guide rails shall conform to ASME A17.1 Section 2.23.
- B. Guide rails for car shall be planed steel T-sections and weigh 22.5 kg/m (15 lb/ft). Guide rails for counterweight shall be planed steel T-sections and weigh 18.0 kg/m (12 lb/ft).
- C. Securely fasten guide rails to the brackets or other supports by heavy duty steel rail clips.
- D. Provide necessary car and counterweight rail brackets and counterweight spreader 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.
- J. After completion of car safety testing during final inspection, all marks left on rails by application of car safety shall be filed smooth.

## **2.28 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 125 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 hoist motor, apply hoist machine brake, and prevent operation of car in either direction.
- D. After final stopping switches have been adjusted, through bolt switches to guide rail.

## **2.29 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.

## **2.30 WORKMAN'S LIGHTS AND OUTLETS**

- A. Provide duplex GFCI protected type receptacles and lamps with guards on top of each elevator car. 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.

## **2.31 TOP-OF-THE 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.

## **2.32 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.

### **2.33 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.

### **2.34 MAIN CAR OPERATING PANEL**

- A. Locate the main car operating panel in the car enclosure on the front return panel for passenger 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. Key operated Independent Service; see Section 2.39 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. Buttons shall be vandal-resistant metal.
  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. Two position switch labeled "FAN" with its positions marked "ON" 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".

### **2.35 INDEPENDENT SERVICE**

- A. Provide a legibly and indelibly labeled "INDEPENDENT SERVICE", two-position key operated switch on the face of the main car operating panel that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.

### **2.36 CAR POSITION INDICATOR**

- A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 50 mm (2 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

### **2.37 AUDIO VOICE SYSTEM**

- A. Provide digitized audio voice system activated by stopping at a floor. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with

ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loud speaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice system shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.

1. Fire Service Message
2. Medical Emergency Service Message
3. "Please do not block doors"
4. Provide special messages as directed by Resident Engineer.

## **2.38 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 control 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 individual phone numbers.
- G. If the operator ends the call, the phone shall be able to redial immediately.

## **2.39 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.

#### **2.40 CORRIDOR OPERATING DEVICES FOR PASSENGER/SERVICE ELEVATORS**

- 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. Provide vandal-resistant metal buttons.
- D. 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.
- E. Jamb-mounted fixtures are not permitted.

#### **2.41 DIGITAL 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 or round lanterns and each intermediate landing with "UP" and "DOWN" digital arrow or round 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.

#### **2.42 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 portion 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 at the VA Medical Center. Arrange the hoistway switch to initiate and maintain movement of the car. When the elevator is operated in the down direction from the top terminal landing, limit the zone of travel to a distance not greater than the top of the car 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.

#### **2.47 HOISTWAY ENTRANCES: PASSENGER ELEVATORS**

- A. Provide entrances of metal construction using cold rolled steel. Door frames shall be constructed of stainless steel. Complete entrances with sills, hanger supports, hangers, tracks, angle struts, unit frames, door panels, fascia plates, toe guards, hardware, bumpers, sight guards, and wall anchors.
- B. Provide one piece extruded aluminum 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 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 100 mm x 100 mm x 9 mm (4 in. x 4 in. x 3/8 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 with wood framing 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 all elevator. 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 a malleable iron or steel bracket. 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.

#### **2.44 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.

#### **2.45 CAR FRAME: PASSENGER 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.

## **2.46 CAR PLATFORM: PASSENGER ELEVATORS**

- A. Construct the car platform to comply with all the requirements of ASME A17.1 Section 2.15.5. The platform shall be designed to withstand the forces developed under the loading conditions specified. Provide car entrances with extruded aluminum 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.

## **2.47 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 that meet the requirement 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 stainless steel. The face of the top section of stainless steel

shall be flush with the face of the bottom section of stainless steel. 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.
- 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 aluminum 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 four panels.
  2. Provide 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 the 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 38 mm (1 1/2 in.) from cab wall. Install handrails on two side and rear walls. Curve ends of handrails to walls. Conceal all handrail fastenings. Handrails shall be removable from inside the car enclosure.
- L. Provide car entrance with two-speed side opening horizontal sliding car doors, of same type as hoistway doors for all elevators. 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 wrapped around the leading and trailing edges. Separate two plates by a sound-deadening material, and reinforce by steel shapes welded to the plates at frequent intervals.



Reinforce panels as required for installation of hangers, power-operating and door-opening devices. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with rubber or non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Upthrust rollers shall be capable of being locked in position after adjustment to a maximum of .38 mm (1/64 in.) clearance. Provide two laminated phenolic gibs on each door panel. Gibs shall be replaceable without removal of door panel. Provide door drive assembly, restrictor, gate switch, header, track, arms, and all related door hardware.

- M. Provide each elevator one set of protection pads and hooks 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 E84, UL 723, NFPA 252, CAN/ULC S102.2, 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.

#### **2.48 POWER DOOR OPERATORS: PASSENGER 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 spring loaded sill mounted type.
- B. Hoistway doors and car gates shall be manually operable in an emergency without disconnecting the power door operating equipment unless the car is outside the unlocking zone.

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 that 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 control 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 and trap doors, etc., to accomplish their work, he must make arrangements, subject to approval of the Resident Engineer, and include additional cost in their bid. Where applicable,

locate controller near and visible to its respective hoisting machinery. 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 control room.
  3. Furnish electric power for testing and adjusting elevator equipment.
  4. Furnish circuit breaker panel in control 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. Control room enclosed and protected from moisture, with self closing, self locking door and access stairs.
  7. Provide fire extinguisher in control 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 control 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 at 75 degrees with the horizontal. Provide steel angle "tents" on tops of exposed steel beams to prevent use as step or surface to place tools.

### **3.3 INSTALLATION**

- A. Perform work with competent Certified Elevator Mechanics and Apprentices skilled in this work and under the direct supervision of the Elevator Contractor's experienced foreman.
- B. Set hoistway entrances in alignment with car openings, and true with plumb sill lines.
- C. Erect hoistway sills, headers and frames prior to erection of rough walls and doors. Erect fascias and toe guards after rough walls are finished.
- D. Install machinery, guides, controls, car and all equipment and accessories in accordance with manufacturer's instructions, applicable codes and standards.

- E. Isolate and dampen machine vibration with properly sized sound-reducing anti-vibration pads.
- F. Grout sills and hoistway entrance frames.

### **3.4 ARRANGEMENT OF EQUIPMENT**

- A. Clearance around elevator, mechanical and electrical equipment shall comply with applicable provisions of NEC. Arrange equipment in control room so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment in the same control room. Locate controller near and visible to its respective hoisting machine.

### **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 new 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. Beams, slabs, or other building construction protruding more than four inches into the hoistway, all top surfaces shall be beveled at an angle of at least 75 degrees to the horizontal.
- F. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.
- G. Hoist cables that are exposed to accidental contact in the control room and pit shall be completely enclosed with 16-gauge sheet metal or expanded metal or guards.
- H. 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 control room and equipment.
- B. Perform hoistway clean down.
- C. Prior to final acceptance; remove protective coverings from finished or ornamental surfaces. Clean and polish surfaces with regard to type of material.

### **3.7 PAINTING AND FINISHING**

- A. Hoist machine, motor, shall be factory painted with manufacturer's standard finish and color.

- B. Controller, sheave, car frame and platform, counterweight, 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. Field painting of governors shall be in accordance with ASME A17.1 Rule 2.18.3.1.
- E. 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.
- F. Elevator hoisting machine, controller, governor, main line shunt trip circuit breaker, safety plank, and cross head of car 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.
- G. Hoistway Entrances of Passenger Elevators:
  - 1. 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.
- H. Elevator Cabs for Passenger 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 stainless steel.
  - 3. Exterior faces of car doors shall be stainless steel.

### **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 Electric 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, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stop watch, and a means of two-way communication.
- B. Inspect workmanship, equipment furnished, and installation for compliance with specification.
- C. Balance Tests: The percent of counterbalance shall be checked by placing test weights in car until the car and counterweight are equal in weight when located at the mid-point of travel. If the actual percent of counter balance does not conform to the specification, the amount of counterweight shall be adjusted until conformance is reached.
- D. 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.
- E. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load, balanced load and no load in the elevator. Speed shall be determined by applying a certified tachometer to the car hoisting ropes or governor rope. The actual measured speed of the elevator with all loads in either direction shall be within three (3) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- F. Temperature Rise Test: The temperature rise of the hoisting 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 control room equipment is within five (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.
- G. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car, balanced 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.
- H. Brake Test: The action of the brake shall be prompt and a smooth stop shall result in the up and down directions of travel with no load and rated load in the elevator. Down stopping shall be tested with 125 percent of rated load in the elevator.

- I. 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.
- J. Safety Devices and Governor Tests: The safety devices and governor shall be tested as required by ASME A17.1 Section 8.10.
- K. Overload Devices: Test all overload current protection devices in the system at final inspection.
- L. 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.
- 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 two hours. 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 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 Mechanics 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 elevators. The Elevator Contractor shall perform the following:
  - 1. Monthly 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. Equalizing tension, shorten or renew hoisting belts where necessary to maintain the safety factor.
  - 5. 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, signal system, car safety device, governors, tension and sheaves in pit shall be cleaned, lubricated and adjusted.
6. Guide rails, overhead sheaves and beams, counterweight frames, and bottom of platforms shall be cleaned every three months. Car tops and control room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning of the entire installation including all control room equipment and hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
  7. Maintain the performance standards set forth in this specification.
  8. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
  9. 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 or his authorized representative.
- F. The Elevator Contractor shall maintain a log book in the control room. The log shall list the date and time of all 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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