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**SPECIFICATIONS  
VOLUME ONE**

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**RENOVATE ADMINISTRATION  
SPACE FOR DENTAL CLINIC B9**

**VA MEDICAL CENTER  
SHERIDAN, WYOMING**

**PROJECT NO: 666-11-111**



**26 OCTOBER 2012**

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**DEPARTMENT OF VETERANS AFFAIRS  
VHA MASTER SPECIFICATIONS  
RENOVATE ADMINISTRATION SPACE FOR DENTAL CLINIC B9**

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

**1.1 GENERAL INTENTION**

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for the Renovate Administration Space for Dental Clinic B9 project on the Sheridan VAMC Station, as required by drawings and specifications.
- B. Visits to the site by Bidders are limited to group visits as indicated in the solicitation. Individual visits to the site are not permitted.
- C. Offices of Kenneth Hahn Architects, Inc., as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- D. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.
- E. Safety Submittals Required Prior To Commencing Work and/or Notice To Proceed:
  - 1. Prior to commencing work, the general contractor will designate an OSHA certified "competent person" (CP) (29 cfr 1926.20 (b) (2)) to serve as the sole point of contact responsible for safety management on the project site. Competent persons are defined as those capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous, or dangerous, and who have the authority to take prompt corrective measures to eliminate them. The CP will maintain a presence at the work site whenever the general or subcontractors are present. This CP designation is a formal, required submittal that requires approval by the Contracting Officer's Representative (COR).
  - 2. Federal acquisition regulation (FAR) 52.236-13, with alternate 1, requires submittal and approval of a safety plan, specific to the project and to the construction site. The contractor will submit a safety plan that includes detailed safety precautions and practices

to mitigate identified hazards specific to this project and to this construction site. This plan is a formal, required submittal that requires approval by the Contracting Officer's Representative (COR).

3. The contractor will submit proof of 30-hour OSHA safety course (i.e., copies of documentation) for prime contractor-designated competent persons as well as any subcontractor-designated competent persons that will work on the site. This proof is a formal, required submittal that requires approval by the Contracting Officer's Representative (COR).
4. The contractor will submit proof of 10-hour OSHA safety course (i.e., copies of documentation) for all other prime contractor employees as well as any subcontract employees that will work on the site. This proof is a formal, required submittal that requires approval by the Contracting Officer's Representative (COR).
5. Submittals must include the names, qualifications, and training dates for the prime contractor-designated competent person (CP) designated to administer the site-specific safety program, as well as the CP (if different) for high risk activities as required by OSHA regulations, such as scaffolding, crane operations, excavations, trenching, etc."

F. Training:

1. All employees of general contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by VA CP with input from the ICRA team.
2. The General Contractor shall submit copies of employee 10-hour OSHA card to the COR prior to start of work.

## 1.2 STATEMENT OF BID ITEM(S)

- A. BASE BID, GENERAL CONSTRUCTION: Work includes general construction, alterations, walks, grading, drainage, mechanical and electrical work, utility systems, elevators, necessary removal of existing structures and construction, and certain other items as indicated on the Drawings and in the Specifications.
- B. ADD ALTERNATE NO. 1: All work complete for providing and installing new HVAC in the Police area on the Second Floor of Building B9, including: Removing and replacing suspended acoustic panel ceiling system in Rooms 200, 201, 203, and C201; providing and installing new VAV boxes and associated ductwork in the aforementioned rooms, and; Electrical and

building automation controls associated with the VAV boxes. Work associated with replacing the return air duct primarily in Corridor C201 shall be included in Base Bid.

- C. ADD ALTERNATE NO. 2: All work complete for providing and installing exterior aluminum frame window F06 in Corridor C203.
- D. ADD ALTERNATE NO. 3: All work complete for providing and installing new dental vacuum receiver tanks and separator in Storage 107, in lieu of relocating existing receiver tanks and separator. See Sheet P-100.

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

- A. AFTER AWARD OF CONTRACT, the Contractor shall be responsible for printing contract drawings and specifications with posted amendments for use during construction.
- B. The Contractor shall furnish the Contracting Officer's Representative (COR) two (2) full-size sets and (6) half-size sets of contract drawings with posted amendments.

### **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 subcontractors 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.
    - a. Prior to commencement of work, all Contractor employees and subcontractors shall be issued appropriate 30 day or PIV Flash badges. Contractor shall coordinate with COR for badge issuance. All Contractor employees and subcontractor personnel must wear appropriate badges at all times.
    - b. PIV Flash Badges are the property of the U.S. Government and must be returned at the close of the project, or upon changes in onsite

personnel. Final contract payment amounts of \$250.00 minimum per PIV badge shall be held back until Government issued badges are returned.

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 and/or escort 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 provide duplicate keys and lock combinations to the Resident Engineer for the purpose of security inspections of every area of project, including tool boxes and parked machines, and to take any emergency action.
2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation. See Section 08 71 00, DOOR HARDWARE, and coordinate.

D. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
4. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access

to only those who will need it for the project. Return the information to the Contracting Officer upon request.

5. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
6. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
7. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
8. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
  - a. Security, access and maintenance of all project drawings, both scanned and electronic, shall be performed and tracked through the EDMS system.
  - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

#### E. Motor Vehicle Restrictions

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

### **1.5 ACCIDENT PREVENTION (NOVEMBER, 1991)**

- A. The Contractor shall provide and maintain work environments and procedures which will:
  1. Safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities;
  2. Avoid interruptions of Government operations and delays in project completion dates; and
  3. Control costs in the performance of this contract.

- B. For these purposes on contracts for construction or dismantling, demolition, or removal of improvements, the Contractor shall:
  - 1. Provide appropriate safety barricades, signs, and signal lights;
  - 2. Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and
  - 3. Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for the purposes are taken.
- C. Whenever the Contracting Officer becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public or Government personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. This notice, when delivered to the Contractor or the Contractor's representative at the work site, shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.
- D. The Contractor shall insert this clause, including this paragraph (e), with appropriate changes in the designation of the parties, in subcontracts.
- E. Before commencing the work, the Contractor shall:
  - 1. Submit a written proposed plan for implementing this clause. The plan shall include an analysis of the significant hazards to life, limb, and property inherent in contract work performance and a plan for controlling these hazards; and
  - 2. Meet with representatives of the Contracting Officer to discuss and develop a mutual understanding relative to administration of the overall safety program.

#### **1.6 FIRE SAFETY**

- A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.



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

E84-2009.....Surface Burning Characteristics of Building  
Materials

2. National Fire Protection Association (NFPA):

10-2010.....Standard for Portable Fire Extinguishers

30-2008.....Flammable and Combustible Liquids Code

51B-2009.....Standard for Fire Prevention During Welding,  
Cutting and Other Hot Work

70-2011.....National Electrical Code

241-2009.....Standard for Safeguarding Construction,  
Alteration, and Demolition Operations

3. Occupational Safety and Health Administration (OSHA):

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

B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to Resident 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 Resident 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 smoke-tight separations between construction areas and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, 3/4 hour fire/smoke rated doors with self-closing devices.
2. Install fire-rated temporary construction partitions to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.
3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.

F. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.

G. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Resident Engineer.

H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Resident 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 Resident 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 Resident Engineer.

- L. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Resident Engineer.
- M. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Resident Engineer.
- N. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to, Resident Engineer.
- O. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.
- P. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- Q. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.

#### **1.7 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 shown on the drawings.
- E. Workmen are subject to rules of Medical Center applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure are not permitted in buildings that are occupied during construction, jointly by patients or medical personnel and Contractor's personnel, except as permitted by Resident Engineer where required by limited working space.
1. Do not store materials and equipment in other than assigned areas.
  2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.
  3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
- G. Building B9 will be occupied during performance of work, but immediate areas of alterations will be vacated.
- H. When a building is turned over to Contractor, Contractor shall accept entire responsibility therefore.

1. Contractor shall maintain a minimum temperature of 4 degrees C (40 degrees F) at all times, except as otherwise specified.
  2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with Fire Department or Company (Department of Veterans Affairs or municipal), whichever will be required to respond to an alarm from Contractor's employee or watchman.
- I. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Resident Engineer.
1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of Resident Engineer. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS for additional requirements.
  2. Contractor shall submit a request to interrupt any such services to Resident Engineer, in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
  3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.

4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the Resident Engineer.
  5. In case of a contract construction emergency, service will be interrupted on approval of Resident Engineer. Such approval will be confirmed in writing as soon as practical.
- J. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions, so that they are completely behind the finished surfaces.
- K. 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.
- L. Coordinate the work for this contract with other construction operations as directed by Resident Engineer. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

### **1.8 ALTERATIONS**

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the Resident Engineer of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both, to the Contracting Officer. This report shall list by rooms and spaces:
1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of building.
  2. Any discrepancies between drawings and existing conditions at site.
  3. 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 Resident 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 Resident 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).

C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and Resident 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.

#### **1.9 INFECTION PREVENTION MEASURES**

- A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. ICRA Group may monitor dust in the vicinity of the

construction work and require the Contractor to take corrective action immediately if the safe levels are exceeded.

- B. Establish and maintain a dust control program as part of the contractor's infection preventive measures in accordance with the guidelines provided by ICRA Group. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to Resident Engineer for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

- 1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the Medical Center.

- C. Medical Center Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may be established by the Medical Center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality.

In addition:

- 1. The RE and VAMC Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in the patient-care rooms are appropriate for their settings. The requirement for negative air pressure in the construction zone shall depend on the location and type of activity. Upon notification, the contractor shall implement corrective measures to restore proper pressure differentials as needed.

- 2. In case of any problem, the medical center, along with assistance from the contractor, shall conduct an environmental assessment to find and eliminate the source.

- D. In general, following preventive measures shall be adopted during construction to keep down dust and prevent mold.

- 1. Dampen debris to keep down dust and provide temporary construction partitions in existing structures where directed by Resident Engineer. Blank-off ducts and diffusers to prevent circulation of dust into occupied areas during construction.



2. Do not perform dust producing tasks within occupied areas without the approval of the Resident Engineer. For construction in any areas that will remain jointly occupied by the Medical Center and Contractor's workers, the Contractor shall:
  - a. Provide dust proof one-hour fire-rated temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. Barriers shall be sealed and made presentable on hospital occupied side. Install a self-closing rated door in a metal frame, commensurate with the partition, to allow worker access. Maintain negative air at all times. A fire retardant polystyrene, 6-mil thick or greater plastic barrier meeting local fire codes may be used where dust control is the only hazard, and an agreement is reached with the Resident Engineer and Medical Center.
  - b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the Medical Center through intake vents or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other pre-filter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.
  - c. Adhesive walk-off carpet / walk-off mats, minimum 600mm x 900mm (24" x 36"), shall be used at all interior transitions from the construction area to occupied Medical Center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
  - d. Vacuum and wet mop all transition areas from construction to the occupied Medical Center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as they are created. Transport these outside the construction area in containers with tightly fitting lids.

- e. The contractor shall not haul debris through patient-care areas without prior approval of the Resident Engineer and the Medical Center. When approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
- f. Using a HEPA vacuum, clean inside the barrier and vacuum ceiling tile prior to replacement. Any ceiling access panels opened for investigation beyond sealed areas shall be sealed immediately when unattended.
- g. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
- h. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

E. Final Cleanup:

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

#### 1.10 DISPOSAL AND RETENTION

A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:

- 1. Reserved items which are to remain property of the Government are noted on drawings or in specifications as items to be stored. Items

that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by Resident Engineer.

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

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

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.
- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and

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

#### **1.12 RESTORATION**

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

#### **1.13 PHYSICAL DATA**

Not used.

#### **1.14 PROFESSIONAL SURVEYING SERVICES**

Not used.

#### **1.15 LAYOUT OF WORK**

Not used.

**1.16 AS-BUILT DRAWINGS**

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

**1.17 USE OF ROADWAYS**

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

**1.18 RESIDENT ENGINEER'S FIELD OFFICE**

Not used.

**1.19 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT**

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to compliance with the following provisions:
  - 1. Permission to use each unit or system must be given by Resident Engineer. If the equipment is not installed and maintained in accordance with the following provisions, the Resident 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. Boilers, pumps, feedwater heaters and auxiliary equipment must be operated as a complete system and be fully maintained by operating personnel. Boiler water must be given complete and continuous chemical treatment.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal shall be replaced with identical replacements, at no additional cost to the Government.
- C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.

#### **1.20 TEMPORARY USE OF EXISTING ELEVATORS**

- A. Use of existing elevator for handling building materials and Contractor's personnel will be permitted subject to following provisions:
1. Contractor makes all arrangements with the Resident Engineer for use of elevators. The Resident Engineer will ascertain that elevators are in proper condition. Contractor may use elevators for special non-recurring time intervals when permission is granted. Personnel for

operating elevators will not be provided by the Department of Veterans Affairs.

2. Contractor covers and provides maximum protection of following elevator components:

- a. Entrance jambs, heads soffits and threshold plates.
- b. Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
- c. Finish flooring.

#### **1.21 TEMPORARY USE OF NEW ELEVATORS**

Not used.

#### **1.22 TEMPORARY TOILETS**

- A. Provide where directed, for use of all Contractor's workmen, ample temporary sanitary toilet accommodations with suitable sewer and water connections; or, when approved by Resident Engineer, provide suitable dry closets where directed. Keep such places clean and free from flies, and all connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean.

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

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The Contractor shall carefully conserve 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, and associated paraphernalia.
- C. Heat: Furnish temporary heat necessary to prevent injury to workmen and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work will not be permitted. Maintain minimum temperatures as specified for various materials.

1. Obtain heat by connecting to Medical Center heating distribution system.
  - a. Steam is available at no cost to Contractor.
- D. Electricity (for Construction and Testing): Furnish all temporary electric services.
  1. Obtain electricity by connecting to the Medical Center electrical distribution system. Electricity is available at no cost to the Contractor.
- E. Water (for Construction and Testing): Furnish temporary water service.
  1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection. Water is available at no cost to the Contractor.
  2. Maintain connections, pipe, fittings and fixtures, and conserve water use so none is wasted. Failure to stop leakage or other wastes will be cause for revocation, at Resident Engineer's discretion, of use of water from Medical Center's system.
- F. Steam: Furnish steam system for testing required in various sections of specifications.
  1. Obtain steam for testing by connecting to the Medical Center steam distribution system. Steam is available at no cost to the Contractor.
  2. Maintain connections, pipe, fittings and fixtures, and conserve steam use so none is wasted. Failure to stop leakage or other waste will be cause for revocation, at Resident Engineer's discretion, of use of steam from the Medical Center's Cemetery's system.
- G. Fuel: Natural and LP gas and burner fuel oil required for boiler cleaning, normal initial boiler-burner setup and adjusting, and for performing the specified boiler tests will be furnished by the Government. Fuel required for prolonged boiler-burner setup, adjustments, or modifications due to improper design or operation of boiler, burner, or control devices shall be furnished by the Contractor at Contractor's expense.



**1.24 NEW TELEPHONE EQUIPMENT**

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

**1.25 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.

**1.26 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 Resident 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 Resident Engineer and shall be considered concluded only when the Resident 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 Resident Engineer, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

#### **1.27 GOVERNMENT-FURNISHED PROPERTY**

Not used.

**1.28 RELOCATED EQUIPMENT**

Not used.

**1.29 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT**

Not used.

**1.30 CONSTRUCTION SIGN**

Not used.

**1.31 SAFETY SIGN**

Not used.

**1.32 PHOTOGRAPHIC DOCUMENTATION**

- A. During the construction period through completion, provide photographic documentation of construction progress and at selected milestones.
- B. Photographic documentation elements:
  - 1. Each digital image shall be taken with a professional grade camera with minimum size of 4 megapixels (MP) capable of producing 100x150mm (4 x 6 inch) prints.
  - 2. Documentation shall be inspection-grade digital photography designed to capture actual conditions throughout construction and at critical milestones. Documentation shall be accessible on-line through use of an internet connection. Documentation shall allow for secure multiple-user access, simultaneously, on-line.
  - 3. Before construction, the building pad, adjacent streets, roadways, parkways, driveways, curbs, sidewalks, landscaping, adjacent utilities and adjacent structures surrounding the building pad and site shall be documented. Overlapping photographic techniques shall be used to insure maximum coverage.
  - 4. Construction progress for all trades shall be tracked at pre-determined intervals, but not less than once every thirty (30) calendar days ("Progressions"). Progression documentation shall track both the exterior and interior construction of the building. Exterior Progressions shall track 360 degrees around the site and each building. Interior Progressions shall track interior improvements beginning when stud work commences and continuing until Project completion.

5. As-built condition of pre-slab utilities and site utilities shall be documented prior to pouring slabs, placing concrete and/or backfilling. This process shall include all underground and in-slab utilities within the building envelope and utility runs in the immediate vicinity of the building envelope. Overlapping photographic techniques shall be used to insure maximum coverage.
  6. As-built conditions of mechanical, electrical, plumbing and all other systems shall be documented post-inspection and pre-insulation, sheet rock or dry wall installation. This process shall include all finished systems located in the walls and ceilings of all buildings at the Project. Overlapping photographic techniques shall be used to insure maximum coverage.
  7. As-built conditions of exterior skin and elevations shall be documented with an increased concentration of digital photographs as directed by the Resident Engineer in order to capture pre-determined focal points, such as waterproofing, window flashing, or architectural detailing. Overlapping photographic techniques shall be used to insure maximum coverage.
  8. As-built finished conditions of the interior of each building including floors, ceilings and walls shall be documented at certificate of occupancy or equivalent, or just prior to occupancy, or both, as directed by the Resident Engineer. Overlapping photographic techniques shall be used to insure maximum coverage.
  9. Customizable project-specific digital photographic documentation of other details or milestones.
- C. Images must show distinctly, at as large a scale as possible, all parts of work embraced in the picture.
- D. Upon completion of the project, final copies of the documentation (the "Permanent Record") shall be provided in an electronic media format, typically a DVD or external hard-drive.

### **1.33 FINAL ELEVATION DIGITAL IMAGES**

Not used.

### **1.34 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 Resident Engineer verbally, and then with a written follow up.

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

**PART 1- GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 CONTRACTOR'S REPRESENTATIVE:**

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

**1.3 CONTRACTOR'S CONSULTANT:**

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

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

#### **1.4 COMPUTER PRODUCED SCHEDULES**

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

#### **1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL**

- A. Within 45 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless

submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The Contracting Officer's separate approval of the Project Schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. **The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the entire contract duration as defined in the bid documents.** These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

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



## 1.6 WORK ACTIVITY/EVENT COST DATA

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

## 1.7 PROJECT SCHEDULE REQUIREMENTS

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

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

Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.
- C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COTR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase regardless of the COTR's approval of the Project Schedule.

- D. Compact Disk Requirements and CPM Activity/Event Record Specifications:  
Submit to the VA an electronic file(s) containing one file of the data required to produce a schedule, reflecting all the activities/events of the complete project schedule being submitted.

#### **1.8 PAYMENT TO THE CONTRACTOR:**

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

#### **1.9 PAYMENT AND PROGRESS REPORTING**

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the COTR and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other data required and provide this information to the COTR three work days in advance of the schedule update meeting. Job progress will be reviewed to verify:
1. Actual start and/or finish dates for updated/completed activities/events.
  2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
  3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.
  4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
  5. Completion percentage for all completed and partially completed activities/events.
  6. Logic and duration revisions required by this section of the specifications.

7. Activity/event duration and percent complete shall be updated independently.
- B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and resident engineer for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by the resident engineer. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the resident engineer within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**
- D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is

behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

#### **1.10 RESPONSIBILITY FOR COMPLETION**

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

#### **1.11 CHANGES TO THE SCHEDULE**

- A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:
  - 1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
  - 2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
  - 3. The schedule does not represent the actual prosecution and progress of the project.
  - 4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.
- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or

any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.

- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA representative.
- D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

#### **1.12 ADJUSTMENT OF CONTRACT COMPLETION**

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COTR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.
- B. Actual delays in activities/events which, according to the computer-produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.
- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions,

duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.

- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

- - - E N D - - -

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

- 1-1. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1-2. For the purposes of this contract, samples, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1-3. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
  - A. Satisfactory written evidence is presented to, and approved by, Contracting Officer that manufacturer cannot make scheduled delivery of approved item or;
  - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity, or;
  - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1-4. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract required items. Delays attributable to untimely and rejected submittals will not serve as a basis for extending contract time for completion.
- 1-5. Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by Resident Engineer on behalf of the Contracting Officer.
- 1-6. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1-7. The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefor by Contracting Officer, adjustment in contract price and time will be made in accordance with Articles titled CHANGES (FAR



52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.

- 1-8. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect-Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- 1-9. Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.
  - A. Submit samples required by Section 09 06 00, SCHEDULE FOR FINISHES, in quadruplicate. Submit other samples in triple units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
  - B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail or PDF email attachment, and shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any), and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
    1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
    2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
    3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.

- C. In addition to complying with the applicable requirements specified in preceding Article 1.9, samples which are required to have Laboratory Tests (those preceded by symbol "LT" under the separate sections of the specification) shall be tested, at the expense of Contractor, in a commercial laboratory approved by Contracting Officer.
1. Laboratory shall furnish Contracting Officer with a certificate stating that it is fully equipped and qualified to perform intended work, is fully acquainted with specification requirements and intended use of materials and is an independent establishment in no way connected with organization of Contractor or with manufacturer or supplier of materials to be tested.
  2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.
  3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory.
  4. Contractor shall send a copy of transmittal letter to both Resident Engineer and to Architect-Engineer simultaneously with submission of material to a commercial testing laboratory.
  5. Laboratory test reports shall be sent directly to Resident Engineer for appropriate action.
  6. Laboratory reports shall list contract specification test requirements and a comparative list of the laboratory test results. When tests show that the material meets specification requirements, the laboratory shall so certify on test report.
  7. Laboratory test reports shall also include a recommendation for approval or disapproval of tested item.
- D. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.
- E. Approved samples will be kept on file by the Resident Engineer at the site until completion of contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract.

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

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

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

1-10. Samples (except laboratory samples), shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to:

**Kenneth Hahn Architects, Inc.**  
**attn: Mr. Steve Goergen**  
**1343 South 75<sup>th</sup> Street**  
**Omaha, NE 68124**  
**(402) 391-2111**

1-11. At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the Resident Engineer.

- - - E N D - - -

### SUBMITTAL REGISTER: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PROJECT: RENOVATE ADMIN. SPACE FOR DENTAL CLINIC B9  
 PROJECT NO: PN 666-11-111  
 LOCATION: SHERIDAN VAMC  
 ADDRESS: 1848 FORT ROAD, SHERIDAN, WY 82801

ACTION: A - Approved as Submitted  
 CODES: B - Approved Except as Noted - Resubmission not Required  
 C - Approved as Noted - Resubmission Required  
 D - No Action Taken - See Comments  
 E - Disapproved - See Comments - Resubmission Required

CONTRACTOR:

ADDRESS:

NOTE: This Submittal Register is to aid the Contractor in tracking submittal requirements and may not be all inclusive of required submittals.

SPECIFICATION SECTION	DESCRIPTION	DATE SUBMITTED	REVIEWED BY	DATE RETURNED	ACTION	DATE RESUBMITTED	ACTION	COMMENTS
01 00 00	30 Hour OSHA Competent Person Designation / Documentation							Required for Notice to Proceed (NTP)
	OSHA Competent Person Specialized Training Documentation							Required for Notice to Proceed (NTP)
	Schedule of Values (SOV)							Required for Notice to Proceed (NTP)
	Safety Plan - Template Provided by VA to Contractor							Required for Notice to Proceed (NTP)
	10 Hour OSHA Safety Documentation for Each Worker							Required prior to construction start
	Electronic Security Memorandum							Required prior to construction start
	Accident Prevention Plan							Required prior to construction start
	Fire Safety Plan							Required prior to construction start
	Dust Control Plan							Required prior to construction start
01 32 16.15	Scheduling Consultant Qualifications							Required prior to construction start
	Construction Schedule							Within 45 calendar days after Notice to Proceed (NTP)
	AIA Application and Certificate for Payment Documents G702 and G703							Monthly
01 45 29	Construction Materials Testing Laboratories Certificate of Accreditation and Scope of Accreditation							Required prior to construction start
01 57 19	Environmental Protection Plan							Required prior to construction start
01 74 19	Demolition Debris Management Plan							Required prior to construction start
	Construction and Demolition Debris Diversion and Disposal Summary Report							Monthly
01 81 00	Sustainable Design Submittals							
01 91 00	Commissioning Agent Certifications							Within 3 calendar days after Notice to Proceed (NTP)
	Preliminary Commissioning Plan Submittal							Within 45 calendar days after Notice to Proceed (NTP)
	Final Commissioning Plan Submittal							
	Systems Functional Performance Test Procedure							
	Pre-Functional Checklists							
	Test and Inspection Reports							
	Corrective Action Documents							
	Preliminary Commissioning Report Submittal							
	Final Commissioning Report Submittal							
02 82 13	Notifications, Certifications, and License							Required prior to start of abatement
	Proof of License and Certification							Required prior to start of abatement
	Proof of Employee Training and Medical Examination							Required prior to start of abatement

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	Asbestos Removal Plan							Required prior to start of abatement
	Respiratory Protection Plan							Required prior to start of abatement
	Project Contact List							Required prior to start of abatement
	Test Results							
	Waste Manifests							
	Supervisor's Logs							
03 54 13	Manufacturer's Literature and Data							
05 50 00	Manufacturer's Literature and Data							
	Shop Drawings							
	Setting Drawings and Instructions							
06 10 00	Shop Drawings							
06 20 00	Shop Drawings							
	Samples							
	Certificates							
	List of Acceptable Sealers for Preservation Treated Materials							
	Manufacturer's Literature and Data							
07 21 13	Manufacturer's Literature and Data							
	Certificates							
07 84 00	Manufacturer's Literature, Data, and Installation Instructions							
	List of Classification Numbers							
	Certified Laboratory Test Reports							
	Warranty							
07 92 00	Manufacturer's Installation Instructions							
	Manufacturer's Literature and Data							
	Warranty							
08 11 13	Shop Drawings							
08 14 00	Samples							
	Shop Drawings							
	Laboratory Test Reports							
	Warranty							
08 31 13	Shop Drawings							

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	Manufacturer's Literature and Data							
08 41 13	Shop Drawings							
	Manufacturer's Literature and Data							
	Samples							
	Manufacturer's Certificates							
08 71 00	Warranty							
	Hardware Schedule							
	Samples							
	Manufacturer's Literature							
	Certificate of Compliance and Test Reports							
08 80 00	Manufacturer's Certificates							
	Warranty							
	Manufacturer's Literature and Data							
	Samples							
	Preconstruction Adhesion and Compatibility Test Reports							
08 90 00	Shop Drawings							
	Manufacturer's Literature and Data							
	Samples							
09 06 00	Samples							
09 22 16	Manufacturer's Literature and Data							
	Shop Drawings							
	Test Results							
09 29 00	Manufacturer's Literature and Data							
	Shop Drawings							
	Samples							
	Test Results							
09 51 00	Samples							
	Manufacturer's Literature and Data							
	Manufacturer's Certificates							
09 65 13	Manufacturer's Literature and Data							
	Samples							

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	Samples							
	Warranty							
09 68 00	Product Data							
	Samples							
	Shop Drawings							
	Maintenance Data							
	Warranty							
09 91 00	Manufacturer's Literature and Data							
	Sample Panels							
	Sample of Identity Markers							
	Manufacturer's Certificates							
10 11 13	Shop Drawings							
	Manufacturer's Literature and Data							
	Samples							
10 14 00	Samples							
	Manufacturer's Literature							
	Sign Location Plan							
	Shop Drawings							
	Full Size Layout Patterns							
10 26 00	Shop Drawings							
	Manufacturer's Literature and Data							
	Test Reports							
10 28 00	Shop Drawings							
	Samples							
	Manufacturer's Literature and Data							
	Manufacturer's Certificates							
10 44 13	Manufacturer's Literature and Data							
10 51 00	Shop Drawings							
	Samples							
12 24 00	Samples							
	Manufacturer's Literature and Data							

### SUBMITTAL REGISTER: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PROJECT: RENOVATE ADMIN. SPACE FOR DENTAL CLINIC B9  
 PROJECT NO: PN 666-11-111  
 LOCATION: SHERIDAN VAMC  
 ADDRESS: 1848 FORT ROAD, SHERIDAN, WY 82801

ACTION: A - Approved as Submitted  
 CODES: B - Approved Except as Noted - Resubmission not Required  
 C - Approved as Noted - Resubmission Required  
 D - No Action Taken - See Comments  
 E - Disapproved - See Comments - Resubmission Required

CONTRACTOR:

ADDRESS:

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SPECIFICATION SECTION	DESCRIPTION	DATE SUBMITTED	REVIEWED BY	DATE RETURNED	ACTION	DATE RESUBMITTED	ACTION	COMMENTS
21 05 11	Manufacturer's Literature and Data							
	Coordination Drawings							
	Maintenance Data and Operating Instructions							
21 08 00	List of Submittals to be Reviewed by Commissioning Agent							Within 45 calendar days after Notice to Proceed (NTP)
21 10 10	Manufacturer's Literature and Data							
	Detailed Drawings							
	Hydraulic Calculations							
	Operation and Maintenance Data							
	Recommended Preventative Maintenance Schedule							
22 05 11	Manufacturer's Literature and Data							
	Coordination Drawings							
	Maintenance Data and Operating Instructions							
22 05 19	Manufacturer's Literature and Data							
	Operations and Maintenance Manual							
	Shop Drawings							
22 05 23	Manufacturer's Literature and Data							
22 07 11	Shop Drawings							
22 08 00	List of Submittals to be Reviewed by Commissioning Agent							Within 45 calendar days after Notice to Proceed (NTP)
22 11 00	Manufacturer's Literature and Data							
22 13 00	Manufacturer's Literature and Data							
	Shop Drawings							
22 40 00	Plumbing Fixture Cut Sheets							
22 61 13.74	Manufacturer's Literature and Data							
	Station Outlets and Inlets							
	Certifications							
	Qualification Data							
22 62 19.74	Manufacturer's Literature and Data							
	Completed System Readiness Checklist							



### SUBMITTAL REGISTER: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

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23 05 11	Layout Drawings							
	Manufacturer's Literature and Data							
	HVAC Maintenance Data and Operating Instructions							
23 05 12	Shop Drawings							
	Manuals							
	Certification							
	Systems Readiness Checklists							
23 05 41	Manufacturer's Literature and Data							
	Calculations							
23 05 93	Specialists							Within 60 calendar days after Notice to Proceed (NTP)
	AABC or NEBB Publications							
	Design Review Report							
	System Inspection Report							
	Duct Air Leakage Test Report							
	Intermediate and Final TAB Reports							
23 07 11	Shop Drawings							
	Samples							
23 08 00	List of Submittals to be Reviewed by Commissioning Agent							Within 45 calendar days after Notice to Proceed (NTP)
23 09 23	Warranty							
	Manufacturer's Literature and Data							
	Product Certificates							
	Licenses							
	As-Built Control Drawings							
	Operation and Maintenance Manuals							
	Performance Report							
23 21 13	Manufacturer's Literature and Data							
	Manufacturer's Certified Data Report							
	Welder's Qualification Certificate							
	Coordination Drawings							
	As-Built Piping Diagrams							
23 22 13	Manufacturer's Literature and Data							
	Manufacturer's Certified Data Report							

### SUBMITTAL REGISTER: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

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	Coordination Drawings							
	As-Built Piping Diagrams							
23 22 23	Manufacturer's Literature and Data							
	Manufacturer's Installation, Maintenance and Operating Instructions							
	Characteristic Curves							
23 25 00	Manufacturer's Literature and Data							
	Water Analysis Verification							
	Material Safety Data Sheets							
	Maintenance and Operating Instructions							
23 31 00	Manufacturer's Literature and Data							
	Coordination Drawings							
23 34 00	Manufacturer's Literature and Data							
	Certified Sound Power Levels							
	Motor Rating Types							
	Belt Guards							
	Maintenance and Operating Manuals							
	Certified Fan Performance Curves							
23 36 00	Manufacturer's Literature and Data							
	Certificates							
	Operation and Maintenance Manuals							
	Guarantee							
23 37 00	Manufacturer's Literature and Data							
	Coordination Drawings							
23 40 00	Manufacturer's Literature and Data							
	Air Filter Performance Reports							
	Supplier's Warranty							
23 73 00	Manufacturer's Literature and Data							
	Maintenance and Operating Manuals							
	Test Procedures							
	Shipping Information							
23 82 00	Manufacturer's Literature and Data							

### SUBMITTAL REGISTER: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

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SPECIFICATION SECTION	DESCRIPTION	DATE SUBMITTED	REVIEWED BY	DATE RETURNED	ACTION	DATE RESUBMITTED	ACTION	COMMENTS
	Certificates							
	Operation and Maintenance Manuals							
	Completed Systems Readiness Checklists							
	Guarantee							
23 82 16	Manufacturer's Literature and Data							
	Installation, Operating and Maintenance Instructions							
	Certification Compliance							
	Completed Systems Readiness Checklists							
26 05 11	Maintenance and Operation Manuals							
	Samples							
26 05 21	Manufacturer's Literature and Data							
	Certifications							
26 05 26	Shop Drawings							
	Test Reports							
	Certifications							
26 05 33	Manufacturer's Literature and Data							
	Shop Drawings							
	Certifications							
26 08 00	List of Submittals to be Reviewed by Commissioning Agent							Within 45 calendar days after Notice to Proceed (NTP)
26 09 23	Product Data							
	Manuals							
	Certifications							
26 24 16	Shop Drawings							
	Manuals							
	Certifications							
26 27 26	Shop Drawings							
	Manuals							
	Certifications							
26 29 11	Shop Drawings							
	Manuals							
	Certifications							

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SPECIFICATION SECTION	DESCRIPTION	DATE SUBMITTED	REVIEWED BY	DATE RETURNED	ACTION	DATE RESUBMITTED	ACTION	COMMENTS
26 29 21	Shop Drawings							
	Manuals							
	Certifications							
26 51 00	Product Data							
	Manuals							
	Certifications							
27 05 11	Manuals							
27 05 26	Shop Drawings							
	Test Reports							
	Certifications							
27 05 33	Shop Drawings							
	Certifications							
27 08 00	List of Submittals to be Reviewed by Commissioning Agent							Within 45 calendar days after Notice to Proceed (NTP)
27 10 00	Manufacturer's Literature and Data							
	Certifications							
27 11 00	Environmental Requirements							
	Documents							
	Test Equipment List							
	Samples							
	Certifications							
	Record Wiring Diagrams							
	Surveys							
27 15 00	Environmental Requirements							
	Documents							
	Test Equipment List							
	Samples							
	Certifications							
	Equipment Manuals							
	Record Wiring Diagrams							
	Surveys							
28 05 00	Contractor's Qualifications							

### SUBMITTAL REGISTER: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PROJECT: RENOVATE ADMIN. SPACE FOR DENTAL CLINIC B9  
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SPECIFICATION SECTION	DESCRIPTION	DATE SUBMITTED	REVIEWED BY	DATE RETURNED	ACTION	DATE RESUBMITTED	ACTION	COMMENTS
	Group I Technical Data Package							
	Group III Technical Data Package							
	Group IV Technical Data Package							
	Group V Technical Data Package							
	FIPS 201 Compliance Certificates							
	Samples							
	Completed Systems Readiness Checklists							
	Warranty							
28 05 13	Manufacturer's Literature and Data							
	Certifications							
	Shop Drawings							
	Wiring Diagrams							
	Cable Administration Drawings							
	Project Planning Documents							
	Maintenance Data							
28 05 26	Shop Drawings							
	Test Reports							
	Certifications							
28 05 28.33	Shop Drawings							
	Certifications							
	Completed Systems Readiness Checklists							
	Product Data							
	Coordination Drawings							
	Source Quality Control Test Reports							
28 08 00	List of Submittals to be Reviewed by Commissioning Agent							Within 45 calendar days after Notice to Proceed (NTP)
28 31 00	Drawings							
	Manuals							
	Certifications							
	Warranty							

**SECTION 01 42 19  
REFERENCE STANDARDS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

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

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

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

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

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

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

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

AA	Aluminum Association Inc. <a href="http://www.aluminum.org">http://www.aluminum.org</a>
AABC	Associated Air Balance Council <a href="http://www.aabchg.com">http://www.aabchg.com</a>
AAMA	American Architectural Manufacturer's Association <a href="http://www.aamanet.org">http://www.aamanet.org</a>
AAN	American Nursery and Landscape Association <a href="http://www.anla.org">http://www.anla.org</a>
AASHTO	American Association of State Highway and Transportation Officials <a href="http://www.aashto.org">http://www.aashto.org</a>
AATCC	American Association of Textile Chemists and Colorists <a href="http://www.aatcc.org">http://www.aatcc.org</a>
ACGIH	American Conference of Governmental Industrial Hygienists <a href="http://www.acgih.org">http://www.acgih.org</a>
ACI	American Concrete Institute <a href="http://www.aci-int.net">http://www.aci-int.net</a>
ACPA	American Concrete Pipe Association <a href="http://www.concrete-pipe.org">http://www.concrete-pipe.org</a>
ACPPA	American Concrete Pressure Pipe Association <a href="http://www.acppa.org">http://www.acppa.org</a>
ADC	Air Diffusion Council <a href="http://flexibleduct.org">http://flexibleduct.org</a>
AGA	American Gas Association <a href="http://www.aga.org">http://www.aga.org</a>
AGC	Associated General Contractors of America <a href="http://www.agc.org">http://www.agc.org</a>
AGMA	American Gear Manufacturers Association, Inc. <a href="http://www.agma.org">http://www.agma.org</a>
AHAM	Association of Home Appliance Manufacturers <a href="http://www.aham.org">http://www.aham.org</a>

Renovate Administration

Reference Standards

AISC	American Institute of Steel Construction <a href="http://www.aisc.org">http://www.aisc.org</a>
AISI	American Iron and Steel Institute <a href="http://www.steel.org">http://www.steel.org</a>
AITC	American Institute of Timber Construction <a href="http://www.aitc-glulam.org">http://www.aitc-glulam.org</a>
AMCA	Air Movement and Control Association, Inc. <a href="http://www.amca.org">http://www.amca.org</a>
ANLA	American Nursery & Landscape Association <a href="http://www.anla.org">http://www.anla.org</a>
ANSI	American National Standards Institute, Inc. <a href="http://www.ansi.org">http://www.ansi.org</a>
APA	The Engineered Wood Association <a href="http://www.apawood.org">http://www.apawood.org</a>
ARI	Air-Conditioning and Refrigeration Institute <a href="http://www.ari.org">http://www.ari.org</a>
ASAE	American Society of Agricultural Engineers <a href="http://www.asae.org">http://www.asae.org</a>
ASCE	American Society of Civil Engineers <a href="http://www.asce.org">http://www.asce.org</a>
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers <a href="http://www.ashrae.org">http://www.ashrae.org</a>
ASME	American Society of Mechanical Engineers <a href="http://www.asme.org">http://www.asme.org</a>
ASSE	American Society of Sanitary Engineering <a href="http://www.asse-plumbing.org">http://www.asse-plumbing.org</a>
ASTM	American Society for Testing and Materials <a href="http://www.astm.org">http://www.astm.org</a>
AWI	Architectural Woodwork Institute <a href="http://www.awinet.org">http://www.awinet.org</a>
AWS	American Welding Society <a href="http://www.aws.org">http://www.aws.org</a>



AWWA	American Water Works Association <a href="http://www.awwa.org">http://www.awwa.org</a>
BHMA	Builders Hardware Manufacturers Association <a href="http://www.buildershardware.com">http://www.buildershardware.com</a>
BIA	Brick Institute of America <a href="http://www.bia.org">http://www.bia.org</a>
CAGI	Compressed Air and Gas Institute <a href="http://www.cagi.org">http://www.cagi.org</a>
CGA	Compressed Gas Association, Inc. <a href="http://www.cganet.com">http://www.cganet.com</a>
CI	The Chlorine Institute, Inc. <a href="http://www.chlorineinstitute.org">http://www.chlorineinstitute.org</a>
CISCA	Ceilings and Interior Systems Construction Association <a href="http://www.cisca.org">http://www.cisca.org</a>
CISPI	Cast Iron Soil Pipe Institute <a href="http://www.cispi.org">http://www.cispi.org</a>
CLFMI	Chain Link Fence Manufacturers Institute <a href="http://www.chainlinkinfo.org">http://www.chainlinkinfo.org</a>
CPMB	Concrete Plant Manufacturers Bureau <a href="http://www.cpmc.org">http://www.cpmc.org</a>
CRA	California Redwood Association <a href="http://www.calredwood.org">http://www.calredwood.org</a>
CRSI	Concrete Reinforcing Steel Institute <a href="http://www.crsi.org">http://www.crsi.org</a>
CTI	Cooling Technology Institute <a href="http://www.cti.org">http://www.cti.org</a>
DHI	Door and Hardware Institute <a href="http://www.dhi.org">http://www.dhi.org</a>
EGSA	Electrical Generating Systems Association <a href="http://www.egsa.org">http://www.egsa.org</a>
EEI	Edison Electric Institute <a href="http://www.eei.org">http://www.eei.org</a>
EPA	Environmental Protection Agency <a href="http://www.epa.gov">http://www.epa.gov</a>

ETL	ETL Testing Laboratories, Inc. <a href="http://www.etl.com">http://www.etl.com</a>
FAA	Federal Aviation Administration <a href="http://www.faa.gov">http://www.faa.gov</a>
FCC	Federal Communications Commission <a href="http://www.fcc.gov">http://www.fcc.gov</a>
FPS	The Forest Products Society <a href="http://www.forestprod.org">http://www.forestprod.org</a>
GANA	Glass Association of North America <a href="http://www.cssinfo.com/info/gana.html/">http://www.cssinfo.com/info/gana.html/</a>
FM	Factory Mutual Insurance <a href="http://www.fmglobal.com">http://www.fmglobal.com</a>
GA	Gypsum Association <a href="http://www.gypsum.org">http://www.gypsum.org</a>
GSA	General Services Administration <a href="http://www.gsa.gov">http://www.gsa.gov</a>
HI	Hydraulic Institute <a href="http://www.pumps.org">http://www.pumps.org</a>
HPVA	Hardwood Plywood & Veneer Association <a href="http://www.hpva.org">http://www.hpva.org</a>
ICBO	International Conference of Building Officials <a href="http://www.icbo.org">http://www.icbo.org</a>
ICEA	Insulated Cable Engineers Association Inc. <a href="http://www.icea.net">http://www.icea.net</a>
\ICAC	Institute of Clean Air Companies <a href="http://www.icac.com">http://www.icac.com</a>
IEEE	Institute of Electrical and Electronics Engineers <a href="http://www.ieee.org/">http://www.ieee.org\</a>
IMSA	International Municipal Signal Association <a href="http://www.imsasafety.org">http://www.imsasafety.org</a>
IPCEA	Insulated Power Cable Engineers Association
NBMA	Metal Buildings Manufacturers Association <a href="http://www.mbma.com">http://www.mbma.com</a>

MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc. <a href="http://www.mss-hq.com">http://www.mss-hq.com</a>
NAAMM	National Association of Architectural Metal Manufacturers <a href="http://www.naamm.org">http://www.naamm.org</a>
NAPHCC	Plumbing-Heating-Cooling Contractors Association <a href="http://www.phccweb.org.org">http://www.phccweb.org.org</a>
NBS	National Bureau of Standards See - NIST
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors <a href="http://www.nationboard.org">http://www.nationboard.org</a>
NEC	National Electric Code See - NFPA National Fire Protection Association
NEMA	National Electrical Manufacturers Association <a href="http://www.nema.org">http://www.nema.org</a>
NFPA	National Fire Protection Association <a href="http://www.nfpa.org">http://www.nfpa.org</a>
NHLA	National Hardwood Lumber Association <a href="http://www.natlhardwood.org">http://www.natlhardwood.org</a>
NIH	National Institute of Health <a href="http://www.nih.gov">http://www.nih.gov</a>
NIST	National Institute of Standards and Technology <a href="http://www.nist.gov">http://www.nist.gov</a>
NLMA	Northeastern Lumber Manufacturers Association, Inc. <a href="http://www.nelma.org">http://www.nelma.org</a>
NPA	National Particleboard Association 18928 Premiere Court Gaithersburg, MD 20879 (301) 670-0604
NSF	National Sanitation Foundation <a href="http://www.nsf.org">http://www.nsf.org</a>
NWWDA	Window and Door Manufacturers Association <a href="http://www.nwwda.org">http://www.nwwda.org</a>

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

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

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

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

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

UBC The Uniform Building Code  
 See ICBO

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

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

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

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

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

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 APPLICABLE PUBLICATIONS:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - A325-10.....Structural Bolts, Steel, Heat Treated, 120/105  
ksi Minimum Tensile Strength
  - A370-10.....Definitions for Mechanical Testing of Steel  
Products
  - A490-10.....Heat Treated Steel Structural Bolts, 150 ksi  
Minimum Tensile Strength
  - C1019-11.....Sampling and Testing Grout
  - E329-11.....Agencies Engaged in Construction Inspection  
and/or Testing
  - E543-09.....Agencies Performing Non-Destructive Testing
- C. American Welding Society (AWS):
  - D1.1-10.....Structural Welding Code-Steel

**1.3 REQUIREMENTS:**

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Resident Engineer. When it appears materials furnished, or work performed by Contractor, fail to meet construction contract

requirements, Testing Laboratory shall direct attention of Resident Engineer to such failure.

- C. Written Reports: Testing laboratory shall submit test reports to Resident Engineer and 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 STRUCTURAL STEEL:**

- A. General: Provide shop and field inspection and testing services to certify structural steel work is done in accordance with contract documents. Welding shall conform to AWS D1.1 Structural Welding Code.
- B. Prefabrication Inspection:
  - 1. Review design and shop detail drawings for size, length, type and location of all welds to be made.
  - 2. Approve welding procedure qualifications either by pre-qualification or by witnessing qualifications tests.
  - 3. Approve welder qualifications by certification or retesting.
  - 4. Approve procedure for control of distortion and shrinkage stresses.
  - 5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.
- C. Fabrication and Erection:
  - 1. Weld Inspection:
    - a. Inspect welding equipment for capacity, maintenance and working condition.
    - b. Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.
    - c. Inspect preparation and assembly of materials to be welded for conformance with AWS D1.1.
    - d. Inspect preheating and interpass temperatures for conformance with AWS D1.1.
    - e. Measure 25 percent of fillet welds.
    - f. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:
      - 1) 20 percent of all shear plate fillet welds at random, final pass only.

- 2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
- 3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
- 4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
- 5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.
- g. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.
- h. Verify that correction of rejected welds are made in accordance with AWS D1.1.
- i. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.
- 2. Bolt Inspection:
  - a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
  - b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
  - c. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
  - d. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
  - e. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.
- D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Resident Engineer.

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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 and the Contracting Officer for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
    - a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
    - b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
    - c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
    - d. Description of the Contractor's environmental protection personnel training program.
    - e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.

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

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

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

- isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
    - a. Box and protect from damage existing trees and shrubs to remain on the construction site.
    - b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
    - c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
  3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
  4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
    - a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 10-year (design year) storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
    - b. Reuse or conserve the collected topsoil sediment as directed by the Resident Engineer. 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 at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
  3. Monitor water areas affected by construction.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.

- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Wyoming requirements 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 the Resident Engineer. Repetitive impact noise on the property shall not exceed the following dB limitations:

<u>Time Duration of Impact Noise</u>	<u>Sound Level in dB</u>
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. Use shields or other physical barriers to restrict noise transmission.
  - b. Provide soundproof housings or enclosures for noise-producing machinery.
  - c. Use efficient silencers on equipment air intakes.
  - d. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
  - e. Line hoppers and storage bins with sound deadening material.
  - f. 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 74 19**  
**CONSTRUCTION WASTE MANAGEMENT**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

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



C. Lead Paint: Section 02 83 33.13, LEAD BASED PAINT REMOVAL AND DISPOSAL.

### 1.3 QUALITY ASSURANCE

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

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

#### **1.4 TERMINOLOGY**

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

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

#### **1.5 SUBMITTALS**

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

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

#### **1.6 APPLICABLE PUBLICATIONS**

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

#### **1.7 RECORDS**

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

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

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

## **PART 3 - EXECUTION**

### **3.1 COLLECTION**

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

### **3.2 DISPOSAL**

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

### **3.3 REPORT**

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

fees, manifests, invoices. Include the net total costs for each disposal.

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

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

**1.2 OBJECTIVES**

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

proposing product substitutions and/or changes to specified processes.

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

### **1.3 RELATED DOCUMENTS**

- A. Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT
- B. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS

### **1.4 DEFINITIONS**

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



- J. Post-Consumer Recycled Content: The percentage by weight of constituent materials that have been recovered or otherwise diverted from the solid-waste stream after consumer use
- K. Pre-Consumer Recycled Content: Materials that have been recovered or otherwise diverted from the solid-waste stream during the manufacturing process. Pre-consumer content must be material that would not have otherwise entered the waste stream as per Section 5 of the FTC Act, Part 260 "Guidelines for the Use of Environmental Marketing Claims": [www.ftc.gov/bcp/grnrule/guides980427](http://www.ftc.gov/bcp/grnrule/guides980427)
- L. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 250 miles (400 km) from the Project site
- M. Sealant: Any material that fills and seals gaps between other materials
- N. Type 1 Finishes: Materials and finishes which have a potential for short-term levels of off-gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing.
- O. Type 2 Finishes: "Fuzzy" materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals off-gas
- P. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

## **1.5 SUBMITTALS**

- A. Sustainable Design Submittals:
  - 1. Water Conserving Fixtures: Submittals must include manufacturer's cut sheets for all water-consuming plumbing fixtures and fittings (toilets, urinals, faucets, showerheads, etc.) highlighting maximum flow rates and/or flush rates. Include cut sheets for any automatic faucet-control devices.
  - 2. Elimination of CFCs AND HCFCs: Provide manufacturer's cut sheets for all cooling equipment with manufacturer's product data, highlighting refrigerants; provide manufacturer's cut sheets for all fire-suppression equipment, highlighting fire-suppression agents; provide manufacturer's cut-sheets for all polystyrene insulation (XPS) and

- closed-cell spray foam polyurethane insulation, highlighting the blowing agent(s).
3. Appliances and Equipment: Provide copies of manufacturer's product data for all Energy Star eligible equipment and appliances, including office equipment, computers and printers, electronics, and commercial food service equipment (excluding HVAC and lighting components), verifying compliance with EPA's Energy Star program.
  4. Measurement and Verification Systems: Provide cut sheets and manufacturer's product data for all controls systems, highlighting electrical metering and trending capability components.
  5. Recycled Content: Submittals for all materials with recycled content (excluding MEP systems equipment and components) must include the following documentation: Manufacturer's product data, product literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre-consumer recycled content (by weight) of each material or product
    - a. An electronic spreadsheet that tabulates the Project's total materials cost and combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value) expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate, on an ongoing basis, line items for each material, including cost, pre-consumer recycled content, post-consumer recycled content, and combined recycled content value.
  6. Regional Materials: Submittals for all products or materials expected to contribute to the regional calculation (excluding MEP systems equipment and components) must include the following documentation:
    - a. Cost of each material or product, excluding cost of labor and equipment for installation
    - b. Location of product manufacture and distance from point of manufacture to the Project Site
    - c. Location of point of extraction, harvest, or recovery for each raw material in each product and distance from the point of extraction, harvest, or recovery to the Project Site

- d. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of manufacture for each regional material
  - e. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of extraction, harvest, or recovery for each regional material or product, including, at a minimum, gravel and fill, planting materials, concrete, masonry, and GWB
  - f. An electronic spreadsheet that tabulates the Project's total materials cost and regional materials value, expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate on an ongoing basis, line items for each material, including cost, location of manufacture, distance from manufacturing plant to the Project Site, location of raw material extraction, and distance from extraction point to the Project Site.
7. Outdoor Air Delivery Monitoring: Provide manufacturer's cut sheets highlighting the installed carbon dioxide monitoring system components and sequence of controls shop drawing documentation, including CO2 differential set-points and alarm capabilities.
  8. Interior Adhesives and Sealants: Submittals for all field-applied adhesives and sealants, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content.
    - a. Provide manufacturers' documentation verifying all adhesives used to apply laminates, whether shop-applied or field-applied, contain no urea-formaldehyde.
  9. Interior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content
  10. Exterior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on ambient air quality, must include manufacturer's MSDSs or other manufacturer's Product Data highlighting VOC content.
  11. Floorcoverings:

- a. Carpet Systems: Submittals for all carpet must include the following:
  - 1) A copy of an assessment from the Building for Environmental and Economic Sustainability (BEES) software model, either Version 3.0 or 4.0, with parameters of the model set as described by this specification section.
  - 2) Manufacturer's product data verifying that all carpet systems meet or exceed the testing and product requirements of the Carpet and Rug Institute Green Label Plus program.
- 12. Composite Wood and Agrifiber Binders: Submittals for all composite wood and agrifiber products (including but not limited to particleboard, wheatboard, strawboard, agriboard products, engineered wood components, solid-core wood doors, OSB, MDF, and plywood products) must include manufacturer's product data verifying that these products contain no urea-formaldehyde resins.
- 13. Air Filtration: Provide manufacturer's cut sheets and product data highlighting the following:
  - a. Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs) per ASHRAE HVAC Design Manual for Hospitals and Clinics.
  - b. Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed AHUs are used during construction. See above for requirements
- 14. Mercury in Lighting: Provide manufacturer's cut sheets or product data for all fluorescent or HID lamps highlighting mercury content.
- 15. Lighting Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all lighting controls systems components.
- 16. Thermal Comfort Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all thermal comfort-control systems components.
- 17. Gypsum Wall Board: Provide manufacturer's cut sheets or product data verifying that all gypsum wallboard products are moisture and mold-resistant.
- 18. Fiberglass Insulation: Provide manufacturer's cut sheets or product data verifying that fiberglass batt insulation contains no urea-formaldehyde.

19. Duct Acoustical Insulation: Provide manufacturer's cut sheets or product data verifying that mechanical sound insulation materials in air distribution ducts consists of an impervious, non-porous coatings that prevent dust from accumulating in the insulating materials.
  20. Green Housekeeping: Provide documentation that all cleaning products and janitorial paper products meet the VOC limits and content requirements of this specification section.
- B. Project Materials Cost Data: Provide a spreadsheet in an electronic file indicating the total cost for the Project and the total cost of building materials used for the Project, as follows:
1. Not more than 60 days after the Preconstruction Meeting, the General Contractor shall provide to the Owner and Architect a preliminary schedule of materials costs for all materials used for the Project organized by specification section. Exclude labor costs and all mechanical, electrical, and plumbing (MEP) systems materials and labor costs. Include the following:
    - a. Identify each reused or salvaged material, its cost, and its replacement value.
    - b. Identify each recycled-content material, its post-consumer and pre-consumer recycled content as a percentage the product's weight, its cost, its combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value), and the total combined recycled content value for all materials as a percentage of total materials costs.
    - c. Identify each regional material, its cost, its manufacturing location, the distance of this location from the Project site, the source location for each raw material component of the material, the distance of these extraction locations from the Project site, and the total value of regional materials as a percentage of total materials costs.
    - d. Identify each biobased material, its source, its cost, and the total value of biobased materials as a percentage of total materials costs. Also provide the total value of rapidly renewable materials (materials made from plants that are harvested in less than a 10-year cycle) as a percentage of total materials costs.

- e. Identify each wood-based material, its cost, the total wood-based materials cost, each FSC Certified wood material, its cost, and the total value of Certified wood as a percentage of total wood-based materials costs.
- 2. Provide final versions of the above spreadsheets to the Owner and Architect not more than 14 days after Substantial Completion.
- C. Construction Waste Management: See Section 01 74 19 "Construction Waste Management" for submittal requirements.
- D. Construction Indoor Air Quality (IAQ) Management: Submittals must include the following:
  - 1. Not more than 30 days after the Preconstruction Meeting, prepare and submit for the Architect and Owner's approval, an electronic copy of the draft Construction IAQ Management Plan in an electronic file including, but not limited to, descriptions of the following:
    - 2. Instruction procedures for meeting or exceeding the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 1995, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling
      - a. Instruction procedures for protecting absorptive materials stored on-site or installed from moisture damage
      - b. Schedule of submission to Architect of photographs of on-site construction IAQ management measures such as protection of ducts and on-site stored oil installed absorptive materials
      - c. Instruction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille
      - d. Instruction procedure for replacing all air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit
  - 3. Not more than 30 days following receipt of the approved draft CIAQMP, submit an electronic copy of the approved CIAQMP in an electronic file, along with the following:
    - a. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for all filtration

- media to be installed at return air grilles during construction if permanently installed AHUs are used during construction.
- b. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs).
- 4. Not more than 14 days after Substantial Completion provide the following:
  - a. Documentation verifying required replacement of air filtration media in all air handling units (AHUs) after the completion of construction and prior to occupancy and, if applicable, required installation of filtration during construction.
  - b. Minimum of 18 Construction photographs: Six photographs taken on three different occasions during construction of the SMACNA approaches employed, along with a brief description of each approach, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
- E. Commissioning: See Section 01 91 00 "General Commissioning Requirements" for submittal requirements.
- F. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports for the following:
  - 1. Construction Waste Management: Waste reduction progress reports and logs complying with the requirements of Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
  - 2. Construction IAQ Management: See details below under Section 3.2 Construction Indoor Air Quality Management for Construction IAQ management progress report requirements.

## **1.6 QUALITY ASSURANCE**

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

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

## **PART 2 - PRODUCTS**

### **2.1 PRODUCT ENVIRONMENTAL REQUIREMENTS**

- A. Water-Conserving Fixtures: Plumbing fixtures and fittings shall use in aggregate at least 20% less water than the water use baseline calculated for the building after meeting the Energy Policy Act of 1992 fixture performance requirements. Flow and flush rates shall not exceed the following:
  - 1. Toilets: no more than 1.3 gallons per flush, otherwise be dual flush 1.6/0.8 gallons per flush, and have documented bowl evacuation capability per MaP testing of at least 400 grams
  - 2. Urinals: Waterless or Water sense rated with no more than 0.5 gallons per flush.
  - 3. Lavatory Faucets: 0.5 gpm with automatic faucet controls
  - 4. Kitchen Sink Lavatories: 2.2 gpm
  - 5. Showerheads: no more than 1.5gpm
- B. Elimination of CFCs AND HCFCs:
  - 1. Ozone Protection and Greenhouse Gas Reduction: Base building cooling equipment shall contain no refrigerants other than the following: HCFC-123, HFC-134a, HFC-245fa, HFC-407c, or HFC 410a.
  - 2. Extruded polystyrene insulation (XPS) and closed-cell spray foam polyurethane insulation shall not be manufactured with hydrochlorofluorocarbon (HCFC) blowing agents.
- C. Appliances and Equipment: All materials and equipment being installed that falls under the Energy Star or FEMP programs must be Energy Star or FEMP-rated. Eligible equipment includes refrigerators, motors, laundry equipment, office equipment and more. Refer to each program's website for a complete list.
- D. HVAC Distribution Efficiency:
  - 1. All duct systems shall be constructed of aluminum, stainless steel or galvanized sheet metal, as deemed appropriate based on the application requirements. No fiberglass duct board shall be permitted.



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

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

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

F. Recycled Content of Materials:

1. Provide building materials with recycled content such that post-consumer recycled content value plus half the pre-consumer recycled content value constitutes a minimum of 30% of the cost of materials used for the Project, exclusive of all MEP equipment, labor, and delivery costs. The Contractor shall make all attempts to maximize the procurement of materials with recycled content.
  - a. The post-consumer recycled content value of a material shall be determined by dividing the weight of post-consumer recycled content by the total weight of the material and multiplying by the cost of the material.
  - b. Do not include mechanical and electrical components in the calculations.
  - c. Do not include labor and delivery costs in the calculations.
  - d. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).

- e. Utilize all on-site existing paving materials that are scheduled for demolition as granulated fill, and include the cost of this material had it been purchased in the calculations for recycled content value.
- f. The materials in the following list must contain the minimum recycled content indicated:

Category	Minimum Recycled Content
Compost/mulch	100% post-consumer
Asphaltic Concrete Paving	25% post-consumer
Cast-in-Place Concrete	6% pre-consumer
CMU: Gray Block	20% pre-consumer
Steel Reinforcing Bars	90% combined
Structural Steel Shapes	90% combined
Steel Joists	75% combined
Steel Deck	75% combined
Steel Fabrications	60% combined
Steel Studs	30% combined
Steel Roofing	30% post-consumer
Aluminum Fabrications	35% combined
Rigid Insulation	20% pre-consumer
Batt insulation	30% combined

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

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

phases is intended to achieve the following specific objectives according to the contract documents:

1. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.
  2. Verify and document proper integrated performance of equipment and systems.
  3. Verify that Operations & Maintenance documentation is complete.
  4. Verify that all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
  5. Verify that the VA's operating personnel are adequately trained to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
  6. Document the successful achievement of the commissioning objectives listed above.
- F. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.
- G. The Commissioning Agent, both the firm and individual designated as the Commissioning Agent, shall be certified by at least one of the following entities: the National Environmental Balancing Bureau (NEBB), the Associated Air Balance Council Commissioning Group (AABC), and the Building Commissioning Association (BCA). Certification(s) shall be valid and active. Proof of certification(s) shall be submitted to the Contracting Officer and the Resident Engineer three (3) calendar days after the Notice to Proceed.

## **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 (Commissioning Agent and Architect/Engineer) be conducted through the Resident Engineer.

- C. Whole Building Commissioning is a process that relies upon frequent and direct communications, as well as collaboration between all parties to the construction process. By its nature, a high level of communication and cooperation between the Commissioning Agent and all other parties (Architects, Engineers, Subcontractors, Vendors, third party testing agencies, etc) is essential to the success of the Commissioning effort.
- D. With these fundamental practices in mind, the commissioning process described herein has been developed to recognize that, in the execution of the Commissioning Process, the Commissioning Agent must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Contracting Officer and Resident Engineer. Thus, the procedures outlined in this specification must be executed within the following limitations:
  - 1. No communications (verbal or written) from the Commissioning Agent shall be deemed to constitute direction that modifies the terms of any contract between the Department of Veterans Affairs and the Contractor.
  - 2. Commissioning Issues identified by the Commissioning Agent will be delivered to the Resident Engineer and copied to the designated Commissioning Representatives for the Contractor and subcontractors on the Commissioning Team for information only in order to expedite the communication process. These issues must be understood as the professional opinion of the Commissioning Agent and as suggestions for resolution.
  - 3. In the event that any Commissioning Issues and suggested resolutions are deemed by the Resident Engineer to require either an official interpretation of the construction documents or require a modification of the contract documents, the Contracting Officer or Resident Engineer will issue an official directive to this effect.
  - 4. All parties to the Commissioning Process shall be individually responsible for alerting the Resident Engineer of any issues that

they deem to constitute a potential contract change prior to acting on these issues.

5. Authority for resolution or modification of design and construction issues rests solely with the Contracting Officer or Resident Engineer, with appropriate technical guidance from the Architect/Engineer and/or Commissioning Agent.

### 1.3 RELATED WORK

- A. Section 01 00 00 GENERAL REQUIREMENTS.
- C. Section 21 08 00 COMMISSIONING OF FIRE PROTECTION SYSTEMS.
- D. Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.
- E. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.
- F. Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.
- G. Section 27 08 00 COMMISSIONING OF COMMUNICATIONS SYSTEMS.
- H. Section 28 08 00 COMMISSIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS.

### 1.4 SUMMARY

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

### 1.5 DEFINITIONS

- A. Architect: Includes Architect identified in the Contract for Construction between the Department of Veterans Affairs and Contractor,

plus consultant/design professionals responsible for design of fire suppression, plumbing, HVAC, controls for HVAC systems, electrical, communications, electronic safety and security, as well as other related systems.

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

complete and operational, TAB functions and Pre-Functional Checklists are complete.

- G. System: A system is defined as the entire set of components, equipment, and subsystems which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one component of an entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam supply, chilled water supply, refrigerant supply, hot water supply, controls and electrical service, etc. Another example of a system which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of the fuel supply, combustion air, controls, steam, feedwater supply, condensate return and other related components.
- H. Pre-Functional Checklist: a list of items provided by the Commissioning Agent to the Contractor that require inspection and elementary component tests conducted to verify proper installation of equipment. Pre-Functional Checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some Pre-Functional Checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The term "Pre-Functional" refers to before Systems Functional Performance Testing. Pre-Functional Checklists augment and are combined with the manufacturer's startup checklist and the Contractor's Quality Control checklists.
- I. Seasonal Functional Performance Testing: a test or tests that are deferred until the system will experience conditions closer to their design conditions.
- J. VA: Includes the Contracting Officer, 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 Commissioning Agent.

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

2. Fire Suppression (Division 21)

- a. Fire Protection System (Fire pump, jockey pump, fire pump automatic transfer switch/controller, Wet-pipe fire suppression, Dry-pipe fire suppression, Pre-action fire suppression, dry system air compressors and motors, and clean agent fire suppression).

3. Plumbing (Division 22)

- a. Domestic Hot Water systems (Domestic water heaters, steam-to-hot water converters, hot water circulating pumps and motors, controls, combustion burners/fans/motors).
- b. Dental Compressed Air and Dental Vacuum Systems.
- i. Emergency Plumbing Fixtures (Showers, eye wash stations, water tempering valves, instruments and gages).

4. HVAC (Division 23)

- a. Air Handling Systems (Fans, motors, Variable Speed Drives, cooling coils and control valves, heating coils and control valves, filters, dampers, safeties such as smoke detectors or freezestats and damper end switches, controls, gages, and vibration isolation).
- c. Heating Hot Water Systems (Boilers, controls, instrumentation and gages, flues, heating water pumps and motors, Variable Speed Drives, mixing valves).
- d. Condensate Return Systems (Condensate receivers and transfer pumps, motors, controls, pump alternator, alarms and instrumentation, deaerators, boiler feed pumps and motors, safeties).
- e. Chilled Water Systems (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).
- g. Exhaust Fans (Fan, motor, Variable Speed Drives, controls and safeties).
- h. Steam System (Boilers, controls, gages and instrumentation, safety relief valves, combustion burners/fans/motors, fuel delivery pumps and motors, flues).

- i. 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).
  - k. Laboratory Ventilation Systems (Supply air terminal units and controls, pressure controls and alarms, fans, motors, and Variable Speed Drives).
  - p. 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).
5. Electrical (Division 26)
- a. Utility Service Entrance Switchgear (Fuses and circuit breaker settings, metering, mimic diagram, gages, and controls).
  - e. Utility Power Unit Substations (Transformers and tap settings, fuses and circuit breaker settings, metering, gages, and controls).
  - h. Normal Power Distribution Systems (Grounding tests, coordination study review, major circuit breaker settings, meters and gages, and controls).
  - i. Life Safety Power Distribution Systems (Automatic transfer on loss of normal power, grounding tests, coordination study review, major circuit breaker settings, meters and gages, and controls).
  - j. Critical Power Distribution Systems (Automatic transfer on loss of normal power, grounding tests, coordination study review, major circuit breaker settings, meters and gages, and controls).
  - k. Essential Equipment Power Distribution Systems (Automatic transfer on loss of normal power, grounding tests, coordination study review, major circuit breaker settings, meters and gages, and controls).
  - l. Lighting Controls (Control system hardware and software, scene settings, zone settings, occupancy sensor interface, and unoccupied cycle control).
6. Communications (Division 27)
- a. Facility Telecommunications and Data Distribution Systems.

- c. Public Address and Mass Notification Systems (Amplifiers and head-end hardware, speaker volume, and background noise - i.e. hiss or similar interference).
  - d. Healthcare Intercommunications and Program Systems (Local stations, system hardware and software, and notification signals).
7. Electronic Safety and Security (Division 28)
- a. Fire Detection and Alarm (Master panel and software, addressable units - i.e. pull stations, flow detectors, heat detectors, etc., controls and alarm functions, horns/bells/door releases and other output devices, and fire command center functions - stairwell communications, stairwell pressurization fan start, mechanical systems shutdowns).

#### **1.7 COMMISSIONING TEAM**

##### **A. Members Appointed by Contractor:**

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

##### **B. Members Appointed by VA:**

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

#### **1.8 VA'S COMMISSIONING RESPONSIBILITIES**

- A. Appoint an individual, company or firm to act as the Commissioning Agent.

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

#### **1.9 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES**

- A. The Contractor shall assign a Commissioning Manager to manage commissioning activities of the Contractor, and subcontractors.
- B. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.
- C. The Contractor shall ensure that each installing subcontractor shall assign representatives with expertise and authority to act on behalf of the subcontractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
  - 1. Participate in commissioning coordination meetings.
  - 2. Conduct operation and maintenance training sessions in accordance with approved training plans.
  - 3. Verify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
  - 4. Evaluate commissioning issues and commissioning observations identified in the Commissioning Issues Log, field reports, test reports or other commissioning documents. In collaboration with entity responsible for system and equipment installation, recommend corrective action.
  - 5. Review and comment on commissioning documentation.

6. Participate in meetings to coordinate Systems Functional Performance Testing.
7. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Commissioning Agent for incorporation into the commissioning plan.
8. Provide information to the Commissioning Agent for developing commissioning plan.
9. Participate in training sessions for VA's operation and maintenance personnel.
10. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures to conduct Systems Functional Performance Testing of installed systems.

#### **1.10 COMMISSIONING AGENT'S RESPONSIBILITIES**

- A. Organize and lead the commissioning team.
- B. Prepare the commissioning plan. See Paragraph 1.11-A of this specification Section for further information.
- C. Review and comment on selected submittals from the Contractor for general conformance with the Construction Documents. Review and comment on the ability to test and operate the system and/or equipment, including providing gages, controls and other components required to operate, maintain, and test the system. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the Construction Documents.
- D. At the beginning of the construction phase, conduct an initial construction phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; Pre-Functional Checklists, Systems Functional Performance Testing; and project completion.
- E. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss status of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The Commissioning Agent shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.

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

### 1.11 COMMISSIONING DOCUMENTATION

- A. Commissioning Agent's Certification(s): Commissioning Agent shall submit evidence of valid and current certification(s), as required in Section 1.1(G), to the Contracting Officer.
- B. Commissioning Plan: A document, prepared by Commissioning Agent, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited, to the following:
  - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
  - 2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
  - 3. Identification of systems and equipment to be commissioned.
  - 4. Schedule of Commissioning Coordination meetings.
  - 5. Identification of items that must be completed before the next operation can proceed.
  - 6. Description of responsibilities of commissioning team members.
  - 7. Description of observations to be made.
  - 8. Description of requirements for operation and maintenance training.
  - 9. Schedule for commissioning activities with dates coordinated with overall construction schedule.
  - 10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
  - 11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
  - 12. Preliminary Systems Functional Performance Test procedures.
- C. Systems Functional Performance Test Procedures: The Commissioning Agent will develop Systems Functional Performance Test Procedures for each system to be commissioned, including subsystems, or equipment and interfaces or interlocks with other systems. Systems Functional Performance Test Procedures will include a separate entry, with space for comments, for each item to be tested. Preliminary Systems

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

1. Name and identification code of tested system.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Dated signatures of the person performing test and of the witness, if applicable.
6. Individuals present for test.
7. Observations and Issues.
8. Issue number, if any, generated as the result of test.

- D. Pre-Functional Checklists: The Commissioning Agent will prepare *Pre-Functional Checklists*. *Pre-Functional Checklists shall be completed* and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will spot check *Pre-Functional Checklists* to verify accuracy and readiness for testing. Inaccurate or incomplete *Pre-Functional Checklists* shall be returned to the Contractor for correction and resubmission.
- E. Test and Inspection Reports: The Commissioning Agent will record test data, observations, and measurements on Systems Functional Performance Test Procedure. The report will also include recommendation for system acceptance or non-acceptance. Photographs, forms, and other means appropriate for the application shall be included with data. Commissioning Agent Will compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.
- F. Corrective Action Documents: The Commissioning Agent will document corrective action taken for systems and equipment that fail tests. The documentation will include any required modifications to systems and equipment and/or revisions to test procedures, if any. The Commissioning Agent will witness and document any retesting of systems



and/or equipment requiring corrective action and document retest results.

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

1. Creating an Commissioning Issues Log Entry:

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

2. Documenting Issue Resolution:

- a. Log date correction is completed or the issue is resolved.
- b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
- c. Identify changes to the Contract Documents that may require action.
- d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.

e. Identify person(s) who corrected or resolved the issue.

f. Identify person(s) verifying the issue resolution.

H. Final Commissioning Report: The Commissioning Agent will document results of the commissioning process, including unresolved issues, and performance of systems, subsystems, and equipment. The Commissioning Report will indicate whether systems, subsystems, and equipment have been properly installed and are performing according to the Contract Documents. This report will be used by the Department of Veterans Affairs when determining that systems will be accepted. This report will be used to evaluate systems, subsystems, and equipment and will serve as a future reference document during VA occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents and those that do not meet requirements of the Contract Documents. The commissioning report will include, but is not limited to, the following:

1. Lists and explanations of substitutions; compromises; variances with the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. Design Narrative documentation maintained by the Commissioning Agent.
2. Commissioning plan.
3. Pre-Functional Checklists completed by the Contractor, with annotation of the Commissioning Agent review and spot check.
4. Systems Functional Performance Test Procedures, with annotation of test results and test completion.
5. Commissioning Issues Log.
6. Listing of deferred and off season test(s) not performed, including the schedule for their completion.

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

1. Documentation of deferred and off season test(s) results.
2. Completed Systems Functional Performance Test Procedures for off season test(s).

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

#### **1.12 SUBMITTALS**

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

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

- G. Preliminary Commissioning Report Submittal: The Commissioning Agent will submit three electronic copies of the preliminary commissioning report. One electronic copy, with review comments, will be returned to the Commissioning Agent for preparation of the final submittal.
- H. Final Commissioning Report Submittal: The Commissioning Agent will submit four sets of electronically formatted information of the final commissioning report to the VA. The final submittal will incorporate comments as directed by the VA.
- I. Data for Commissioning:
  - 1. The Commissioning Agent will request in writing from the Contractor specific information needed about each piece of commissioned equipment or system to fulfill requirements of the Commissioning Plan.
  - 2. The Commissioning Agent may request further documentation as is necessary for the commissioning process or to support other VA data collection requirements, including Construction Operations Building Information Exchange (COBIE), Building Information Modeling (BIM), etc.

#### **1.13 COMMISSIONING PROCESS**

- A. The Commissioning Agent will be responsible for the overall management of the commissioning process as well as coordinating scheduling of commissioning tasks with the VA and the Contractor. As directed by the VA, the Contractor shall incorporate Commissioning tasks, including, but not limited to, Systems Functional Performance Testing (including predecessors) with the Master Construction Schedule.
- B. Within 60 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 60 days of contract award, the Contractor shall ensure that each subcontractor designates specific individuals as Commissioning Representatives (CR) to be responsible for commissioning related tasks. The Contractor shall ensure the designated Commissioning Representatives participate in the commissioning process as team members providing commissioning testing services, equipment operation, adjustments, and corrections if necessary. The Contractor shall ensure

that all Commissioning Representatives shall have sufficient authority to direct their respective staff to provide the services required, and to speak on behalf of their organizations in all commissioning related contractual matters.

#### **1.14 QUALITY ASSURANCE**

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

#### **1.15 COORDINATION**

- A. Management: The Commissioning Agent will coordinate the commissioning activities with the VA and Contractor. The Commissioning Agent will submit commissioning documents and information to the VA. All commissioning team members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- B. Scheduling: The Contractor will work with the Commissioning Agent and the VA to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information on commissioning activities to allow the Contractor and the VA to schedule commissioning activities. All parties shall address scheduling issues and make necessary notifications in a timely manner in order to expedite the project and the commissioning process. The Contractor shall update the Master Construction as directed by the VA.
- C. Initial Schedule of Commissioning Events: The Commissioning Agent will provide the initial schedule of primary commissioning events in the Commissioning Plan and at the commissioning coordination meetings. The Commissioning Plan will provide a format for this schedule. As construction progresses, more detailed schedules will be developed by the Contractor with information from the Commissioning Agent.
- D. Commissioning Coordinating Meetings: The Commissioning Agent will conduct periodic Commissioning Coordination Meetings of the commissioning team to review status of commissioning activities, to

discuss scheduling conflicts, and to discuss upcoming commissioning process activities.

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

## **PART 2 - PRODUCTS**

### **2.1 TEST EQUIPMENT**

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

## **PART 3 - EXECUTION**

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

- A. The following procedures shall apply to all equipment and systems to be commissioned, according to Part 1, Systems to Be Commissioned.
  - 1. Pre-Functional Checklists are important to ensure that the equipment and systems are hooked up and operational. These ensure that Systems

Functional Performance Testing may proceed without unnecessary delays. Each system to be commissioned shall have a full Pre-Functional Checklist completed by the Contractor prior to Systems Functional Performance Testing. No sampling strategies are used.

- a. The Pre-Functional Checklist will identify the trades responsible for completing the checklist. The Contractor shall ensure the appropriate trades complete the checklists.
  - b. The Commissioning Agent will review completed Pre-Functional Checklists and field-verify the accuracy of the completed checklist using sampling techniques.
2. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.
- a. The Contractor shall develop the full startup plan by combining (or adding to) the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
  - b. The full startup plan shall at a minimum consist of the following items:
    - 1) The Pre-Functional Checklists.
    - 2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
    - 3) The manufacturer's normally used field checkout sheets.
      - a) The Commissioning Agent will submit the full startup plan to the VA and Contractor for review. Final approval will be by the VA.
      - b) The Contractor shall review and evaluate the procedures and the format for documenting them, noting any procedures that need to be revised or added.

### 3. Sensor and Actuator Calibration



- a. All field installed temperature, relative humidity, CO<sub>2</sub> and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 21, Division 22, Division 23, Division 26, Division 27, and Division 28 specifications.
  - b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
4. Execution of Equipment Startup
- a. Four weeks prior to equipment startup, the Contractor shall schedule startup and checkout with the VA and Commissioning Agent. The performance of the startup and checkout shall be directed and executed by the Contractor.
  - b. The Commissioning Agent will observe the startup procedures for selected pieces of primary equipment.
  - c. The Contractor shall execute startup and provide the VA and Commissioning Agent with a signed and dated copy of the completed startup checklists, and contractor tests.
  - d. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

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

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

original noncompliance report. When satisfactorily completed, the Commissioning Agent will recommend approval of the checklists and startup of each system to the VA.

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

### **3.3 PHASED COMMISSIONING**

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

### **3.4 TRENDING AND ALARMS**

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

- C. The Contractor shall provide a wireless internet network in the building for use during controls programming, checkout, and commissioning. This network will allow project team members to more effectively program, view, manipulate and test control devices while being in the same room as the controlled device.
- D. The Contractor shall provide graphical trending through the DDC control system of systems being commissioned. Trending requirements are indicated below and included with the Systems Functional Performance Test Procedures. Trending shall occur before, during and after Systems Functional Performance Testing. The Contractor shall be responsible for producing graphical representations of the trended DDC points that show each system operating properly during steady state conditions as well as during the System Functional Testing. These graphical reports shall be submitted to the Resident Engineer and Commissioning Agent for review and analysis before, during dynamic operation, and after Systems Functional Performance Testing. The Contractor shall provide, but not limited to, the following trend requirements and trend submissions:
1. Pre-testing, Testing, and Post-testing - Trend reports of trend logs and graphical trend plots are required as defined by the Commissioning Agent. The trend log points, sampling rate, graphical plot configuration, and duration will be dictated by the Commissioning Agent. At any time during the Commissioning Process the Commissioning Agent may recommend changes to aspects of trending as deemed necessary for proper system analysis. The Contractor shall implement any changes as directed by the Resident Engineer. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the Resident Engineer, prior to the execution of Systems Functional Performance Testing.
  2. Dynamic plotting - The Contractor shall also provide dynamic plotting during Systems Functional Performance testing at frequent intervals for points determined by the Systems Functional Performance Test Procedure. The graphical plots will be formatted and plotted at durations listed in the Systems Functional Performance Test Procedure.
  3. Graphical plotting - The graphical plots shall be provided with a dual y-axis allowing 15 or more trend points (series) plotted simultaneously on the graph with each series in distinct color. The

plots will further require title, axis naming, legend etc. all described by the Systems Functional Performance Test Procedure. If this cannot be sufficiently accomplished directly in the Direct Digital Control System then it is the responsibility of the Contractor to plot these trend logs in Microsoft Excel.

4. The following tables indicate the points to be trended and alarmed by system. The Operational Trend Duration column indicates the trend duration for normal operations. The Testing Trend Duration column indicates the trend duration prior to Systems Functional Performance Testing and again after Systems Functional Performance Testing. The Type column indicates point type: AI = Analog Input, AO = Analog Output, DI = Digital Input, DO = Digital Output, Calc = Calculated Point. In the Trend Interval Column, COV = Change of Value. The Alarm Type indicates the alarm priority; C = Critical, P = Priority, and M = Maintenance. The Alarm Range column indicates when the point is considered in the alarm state. The Alarm Delay column indicates the length of time the point must remain in an alarm state before the alarm is recorded in the DDC. The intent is to allow minor, short-duration events to be corrected by the DDC system prior to recording an alarm.

<b>Dual-Path Air Handling Unit Trending and Alarms</b>							
<b>Point</b>	<b>Type</b>	<b>Trend Interval</b>	<b>Operational Trend Duration</b>	<b>Testing Trend Duration</b>	<b>Alarm Type</b>	<b>Alarm Range</b>	<b>Alarm Delay</b>
OA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Humidity	AI	15 Min	24 hours	3 days	P	>60% RH	10 min
Mixed Air Temp	AI	None	None	None	N/A		
SA Temp	AI	15 Min	24 hours	3 days	C	±5°F from SP	10 min
Supply Fan Speed	AI	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AI	15 Min	24 hours	3 days	N/A		
RA Pre-Filter Status	AI	None	None	None	N/A		

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
OA Pre-Filter Status	AI	None	None	None	N/A		
After Filter Status	AI	None	None	None	N/A		
SA Flow	AI	15 Min	24 hours	3 days	C	±10% from SP	10 min
OA Supply Temp	AI	15 Min	24 hours	3 days	P	±5°F from SP	10 min
RA Supply Temp	AI	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
RA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
Initial UVC Intensity (%)	AI	None	None	None	N/A		
Duct Pressure	AI	15 Min	24 hours	3 days	C	±25% from SP	6 min
CO2 Level	AI	15 Min	24 hours	3 days	P	±10% from SP	10 min
Supply Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Return Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 Min
High Static Status	DI	COV	24 hours	3 days	P	True	1 min
Fire Alarm Status	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 1	DI	COV	24 hours	3 days	C	True	10 min
Freeze Stat Level 2	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 3	DI	COV	24 hours	3 days	P	True	1 min
Fire/Smoke Damper Status	DI	COV	24 hours	3 days	P	Closed	1 min
Emergency AHU Shutdown	DI	COV	24 hours	3 days	P	True	1 min

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Exhaust Fan #1 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #2 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #3 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
OA Alarm	DI	COV	24 hours	3 days	C	True	10 min
High Static Alarm	DI	COV	24 hours	3 days	C	True	10 min
UVC Emitter Alarm	DI	COV	24 hours	3 days	P	True	10 min
CO2 Alarm	DI	COV	24 hours	3 days	P	True	10 min
Power Failure	DI	COV	24 hours	3 days	P	True	1 min
Supply Fan Speed	AO	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AO	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AO	15 Min	24 hours	3 days	N/A		
Supply Fan S/S	DO	COV	24 hours	3 days	N/A		
Return Fan S/S	DO	COV	24 hours	3 days	N/A		
Fire/Smoke Dampers	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
AHU Energy	Calc	1 Hour	30 day	N/A	N/A		

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

Unit Heater Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min

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

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



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

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

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
System Flow (GPM)	AI	15 min	12 hours	3 days	N/A		
System Differential Pressure	AI	15 min	12 hours	3 days	P	±10% from SP	8 Min
				3 days			
HW Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 1 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 2 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #1 1/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #1 2/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #2 1/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #2 2/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station Bypass Valve Position	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 1 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HW Pump 2 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HWR #1 Valve	DO	COV	12 Hours	3 days	N/A		
HWR #2 Valve	DO	COV	12 Hours	3 days	N/A		

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 1 Entering Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Leaving Temperature	AI	15 Minutes	12 Hours	3 days	P	±5°F from SP	10 Min
Chiller 1 Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Percent Load	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 KW Consumption	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Entering Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Leaving Temperature	AI	15 Minutes	12 Hours	3 days	P	±5°F from SP	10 Min
Chiller 2 Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Percent Load	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 KW Consumption	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Decoupler Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Supply Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Differential Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Secondary Loop Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Supply Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Return Temperature	AI	15 Minutes	12 Hours	3 days	N/A		

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

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Primary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Primary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Enable	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Iso-Valve Command	DO	COV	12 Hours	3 days	N/A		
Chiller 2 Enable	DO	COV	12 Hours	3 days	N/A		
Chiller 2 Iso-Valve Command	DO	COV	12 Hours	3 days	N/A		

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

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

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

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

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

### 3.5 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

- A. This paragraph applies to Systems Functional Performance Testing of systems for all referenced specification Divisions.
- B. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to the Contract Documents. Systems Functional Performance Testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process,

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

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

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



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

continuing with Systems Functional Performance Testing of the remaining units.

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

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

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

B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported to the VA on Commissioning Field Reports and/or the Commissioning Master Issues Log.

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

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

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

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

### 3.7 DEFERRED TESTING

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

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

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

- A. Training Preparation Conference: Before operation and maintenance training, the Commissioning Agent will convene a training preparation conference to include VA's Resident Engineer, VA's Operations and Maintenance personnel, and the Contractor. The purpose of this conference will be to discuss and plan for Training and Demonstration of VA Operations and Maintenance personnel.
- B. The Contractor shall provide training and demonstration as required by other Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 sections. The Training and Demonstration shall include, but is not limited to, the following:
  - 1. Review the Contract Documents.
  - 2. Review installed systems, subsystems, and equipment.
  - 3. Review instructor qualifications.
  - 4. Review instructional methods and procedures.
  - 5. Review training module outlines and contents.
  - 6. Review course materials (including operation and maintenance manuals).
  - 7. Review and discuss locations and other facilities required for instruction.
  - 8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
  - 9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.
- C. Training Module Submittals: The Contractor shall submit the following information to the VA and the Commissioning Agent:
  - 1. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module. At completion of training, submit two complete training manuals for VA's use.
  - 2. Qualification Data: Submit qualifications for facilitator and/or instructor.

3. Attendance Record: For each training module, submit list of participants and length of instruction time.
4. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
5. Demonstration and Training Videotapes: Submit two copies within seven days of end of each training module.
  - a. Identification: On each copy, provide an applied label with the following information:
    - 1) Name of Project.
    - 2) Name and address of photographer
    - 3) Name of Contractor.
    - 4) Date videotape was recorded.
    - 5) Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
6. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

#### D. QUALITY ASSURANCE

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

#### E. COORDINATION

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

instruction program until operation and maintenance data has been reviewed and approved by the VA.

F. INSTRUCTION PROGRAM

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

- G. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participants are expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria:  
Include the following:
  - a. System, subsystem, and equipment descriptions.
  - b. Performance and design criteria if Contractor is delegated design responsibility.
  - c. Operating standards.



- d. Regulatory requirements.
  - e. Equipment function.
  - f. Operating characteristics.
  - g. Limiting conditions.
  - h. Performance curves.
2. Documentation: Review the following items in detail:
- a. Emergency manuals.
  - b. Operations manuals.
  - c. Maintenance manuals.
  - d. Project Record Documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:

- a. Alignments.
- b. Checking adjustments.
- c. Noise and vibration adjustments.
- d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.
- H. Training Execution:
  - 1. Preparation: Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual. Set up instructional equipment at instruction location.
  - 2. Instruction:
    - a. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Department of Veterans Affairs for number of participants, instruction times, and location.
    - b. Instructor: Engage qualified instructors to instruct VA's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

- 1) The Commissioning Agent will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
- 2) The VA will furnish an instructor to describe VA's operational philosophy.
- 3) The VA will furnish the Contractor with names and positions of participants.
3. Scheduling: Provide instruction at mutually agreed times. For equipment that requires seasonal operation, provide similar instruction at start of each season. Schedule training with the VA and the Commissioning Agent with at least seven days' advance notice.
4. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of **an oral, or a written**, performance-based test.
5. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

I. Demonstration and Training Recording:

1. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
2. Video Format: Provide high quality color DVD color on standard size DVD disks.
3. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
4. Narration: Describe scenes on videotape by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

----- END -----

**APPENDIX A**

**OWNER' S PROJECT REQUIREMENTS (OPR)**

**RENOVATE ADMINISTRATION SPACE FOR DENTAL CLINIC B9  
VA MEDICAL CENTER  
SHERIDAN, WYOMING**

**OWNER'S PROJECT REQUIREMENTS (OPR)**

**Owner and User Requirements**

**1. Purpose**

- A. The purpose of this project is to renovate the existing Director's Suite on the second floor of Building B9 to provide accommodations for the Dental Clinic, which is currently located on the second floor of Building B71.

**2. Project Description**

- A. This project will cover approximately 3,357 square feet of floor space on the second floor of Building B9. The existing space contains one Men's Restroom where domestic water and waste piping are present. Exhaust air capabilities are provided for this restroom from the Attic Mechanical Equipment Room. The new Dental Clinic will require an additional restroom, clinic sinks, dental laboratory support fixtures, and dental service fixtures. Additional plumbing services such as dental vacuum and dental air are required as part of the new mechanical design, as well as additional room exhaust air capabilities for the Dental Laboratory and Restroom.
- B. The second and third floors of Building B9 were renovated in 1995. Each of the two floor levels are served by separate air handling units located in the Attic Mechanical Equipment Room. Air handling unit AHU-2 serves the second floor level. This air handling unit is rated to deliver 5,110 CFM of supply air to the space. This air handling unit operates as a Variable Air Volume (VAV) unit serving a total of 10 VAV terminal units. Each terminal unit is equipped with a hot water reheat coil to provide heat to the space. The air handling unit system is equipped with a glycol pre-heat heating coil and a chilled water cooling coil, as well as a dedicated return air fan and air-side economizer section to allow free cooling during fall, winter, and spring months. The air handling unit does not have sufficient capacity to serve the newly remodeled Dental Clinic, nor does the existing air handling unit have the required air filtration capabilities.
- C. The two existing hot water heating heat exchangers and two existing end suction circulating pumps located in the first floor that currently serve the VAV reheat coils and perimeter fintube radiation shall be maintained for this project. New VAV reheat coils and perimeter fintube heating units shall be provided. The perimeter fintube shall be installed under each of the existing exterior windows and in restrooms located along perimeter walls. Both perimeter fintube radiant heat and VAV reheat coils shall be controlled individually for each VAV terminal temperature control zone.
- D. The existing glycol/water heat exchanger and two inline circulating pumps located in Building B71 for serving the new pre-heat coil of air handling units AHU-1 and AHU-2 that were installed in 1995 shall be re-used and re-balanced to handle the new water flow requirements of the new pre-heat coil. This heat exchanger was sized for a 130 deg F entering water temperature and a 160 deg F leaving water temperature. These temperatures could be raised to increase the heating capacity of the air handling unit heating coils if needed.
- E. The existing steam-fired instantaneous domestic water heaters located in the attic Mechanical Equipment Room in Building 71 are adequate for the new plumbing systems. Typically a Dental

Clinic does not have a high demand for domestic hot water.

- F. There is currently a 4-inch waste riser and a 3-inch waste riser coming up through the second floor level to serve the existing needs of the third floor level. These waste risers originate in the first floor and will be tied into to serve the new plumbing fixtures on the second level.
- G. There are currently 2-1/2-inch domestic cold water, 1-1/2-inch domestic hot water, and a 1-inch domestic hot water re-circulation risers coming up from the first floor to the second floor ceiling space with valves in place on the second floor level. The valves stubbed out are 2-inch domestic cold water, 1-inch domestic hot water, and a 1/2-inch re-circulating hot water line.

### 3. Economic Summary

- A. The Order of Magnitude for this project is \$1,000,000, to \$5,000,000 as indicated in the Scope of Services document, dated 31 August 2011. A Value Engineering Study has not been performed on this project.

### 4. Sustainable Design Requirements

- A. The Renovate Administration Space for Dental Clinic B9 project will utilize the LEED 2009 for Commercial Interiors (LEED-CI 2009) rating system, since it is an interior remodel of an existing office space and will utilize the existing HVAC, electrical, and plumbing systems.
- B. The facility is not intended to achieve LEED certification, and will not be registered with the United States Green Building Council (USGBC). However, the Design Team is responsible for documenting the design credits and the Contractor will be responsible for documenting the construction credits.

### **Energy Efficiency, Environmental and Sustainability Goals**

- 1. In addressing the section "Energy & Atmosphere," one of the prerequisites is for the project to meet the requirements of ASHRAE Standard 90.1-2004 Energy Standard for Buildings except Low-Rise Residential Buildings. This facility will meet this standard as well as provisions of the Department of Veterans Affairs HVAC Design Manual.
- 2. In order to increase the energy efficiency of this facility, the mechanical systems will include the following energy saving design features:
  - A. Water Hydronic Systems: Heat will be provided to the building through the existing steam-fired hot water heating systems. As part of this project the contractor shall install variable frequency drives on all circulating pumps. This will provide a means for saving pump operating energy. The hot water supply temperature will also be re-set based on the outside air temperature.
  - B. Temperature differentials on these hydronic systems will be maximized to reduce the water flow rates to the equipment. This approach will reduce the amount of power required to circulate heating and cooling energy to the HVAC equipment located throughout the building.
  - C. Using carbon dioxide (CO<sub>2</sub>) monitoring for ventilation air control. This control scheme can help reduce ventilation energy by introducing only the amount of fresh air necessary to keep the building ventilated. The ventilation systems will be shut down when the building is not occupied.
  - D. Provide duty cycling of the air terminal units serving each room based on occupancy. Occupancy

sensors will be provided in each space to control both HVAC and lighting.

- E. The building includes a good thermal envelope. The walls will be designed with a high R-value, and the windows are currently equipped with insulating glass.
- F. Additional free cooling will be realized through the air-side economizer of air handling unit AHU-2.
- G. Premium efficiency motors will be provided on all new air handling units, exhaust fans, and existing hot water heating pumps. Where variable air volume (AHU-1 and AHU-5) and variable water flow systems (existing hot water heating system) are used, variable frequency drives will be provided.
- H. Each office, operatory, laboratory, waiting room, and patient care space will have individual temperature control consisting of a temperature sensor, CO2 sensor, occupancy sensor, and VAV terminal unit.
- I. The air handling unit supply fan and return fan are equipped with variable speed drives so these systems only deliver the amount of air required by the terminal units serving each space.

### **Indoor Environmental Quality Requirements**

1. Design Conditions: This facility shall be modeled per ASHRAE 90.1-2004 and EPA 2005, and shall conform to their requirements. Provide new mechanical systems, complete and ready for operation. The design and installation of all mechanical systems, including manufacturer's products, shall meet the instructions and requirements contained herein and the requirements of the referenced technical guide specifications. Where conflicts between these instructions and the guide specifications or criteria exist, these instructions shall take precedence.

2. Indoor Design Conditions:

Room Description	Temperature	Humidity
Procedure Rooms	75 deg F (summer)	30 to 60% RH
	70 deg F (winter)	
Offices/Waiting Rooms	75 deg F (summer)	30 to 60% RH
	70 deg F (winter)	
Data/Comm Rooms	72 deg F (year around)	50% RH
Dental Laboratory	75 deg F (summer)	30 to 60% RH
	70 deg F (winter)	
Electrical Equipment Rooms	78 deg F (summer)	
	55 deg F (winter)	

3. Outdoor Design Conditions (ASHRAE Fundamentals Handbook):

A. Summer Conditions: 105 deg F D.B., 61 deg F W.B.

B. Winter Conditions: -20 deg F D.B.

4. Site Elevation: Equipment design elevation is 3,967 feet above sea level. Appropriate corrections shall be made when calculating the capacity of all mechanical equipment installed at this elevation.

A. Latitude: 44.77 deg N

B. Heating Degree Days: 7,636

C. Cooling Degree Days: 407

5. Hours of Operation: It is assumed that the Dental Clinic will operate 10 hours per day, Monday through Friday. The other 14 hours per day Monday through Friday, Saturday, and Sunday will be unoccupied.

6. Ventilation Rates:

AIA Guidelines/ASHRAE 62	Ventilation Rates
Procedure Rooms	2 air changes per hour
Offices/Waiting Rooms	20 CFM per person
Dental Laboratory	12 Air Changes Per Hour
Restrooms	10 – 15 air changes per hour
Mechanical Equipment Rooms	20 air changes per hour
Janitors	15 air changes per hour

7. Noise Criteria: The mechanical systems shall be designed and built to not exceed the noise criteria as shown in the table below. Noise and vibration control shall meet the requirement of ASHRAE HB.

ASHRAE HB	Noise Criteria (NC) Levels
Procedure Rooms	NC-30
Offices/Waiting Rooms	NC-35
Dental Laboratory	NC-35
Restrooms	NC-35
Mechanical Equipment Rooms	NC-50
Janitors	NC-35

8. HVAC System Design Criteria:

A. Building User Population: Will be based on room furniture layout.

B. Internal Heat Load: Based on current design conditions.

C. Lighting: Based on actual lighting design.

D. Power: Based on final design.

E. Building Envelope: ASHRAE Standards.

F. Outside Air: ASHRAE Standard 62 (2004) requirements must be met. Outside air shall be constant at the air handling units when the building is occupied regardless of VAV operation. Provide outdoor air flow measurement from the DDC control system to modulate outside air, relief air, and return air dampers. All fresh air louvers shall be installed a minimum of 30-feet above grade or on roof away from roof line.

G. Duct Velocities:

Duct System	Velocities/Pressure Drop
Medium pressure supply	2,400 FPM or .5 “ WC per 100 ft.



Low pressure supply	1,200 FPM or .08 “ WC per 100 ft.
Return air	1,800 FPM or .08” WC per 100 ft.
Exhaust air	1,800 FPM or .08” WC per 100 ft.
Outside air	1,800 FPM or .10” WC per 100 ft.
Relief air	1,800 FPM or .10” WC per 100 ft.

- H. Chilled Water: Chilled water supply temperature is based on 44 deg F from the existing chillers.
- I. Heating Hot Water: Heating hot water supply temperature shall be 190 deg F for both the pre-heat water and the reheat water temperature.
- J. Air Handling Unit Cooling Coils: Face velocity shall be limited to 500 FPM.
- K. Exposed Ductwork: Exposed ductwork will not be allowed in rooms with ceilings. Offsets and turns shall be gradual and built to maintain uniform flow.
- L. Fintube radiant heaters shall be provided beneath exterior windows. All fintube heaters shall be supplied with heating hot water from the reheat hot water heating system.

#### **Equipment and System Expectations**

1. A VAV air handling unit will replace the existing air handling unit and will be located in the Attic Mechanical Equipment Room. The air handling unit will deliver 6,500 CFM of supply air and be equipped with a mixing box; pre-filter section; glycol heating coil; access section complete with humidification grid; glycol cooling coil; access section; plenum fan section; final filter section; and a supply plenum. A factory mounted variable frequency drive will be provided for the fan section. The VAV air handling unit will be equipped with an air-side economizer to take advantage of free cooling during spring, fall, and winter conditions.
2. The new air handling unit will serve 13 VAV terminal units with reheat coils. This system will also allow each temperature control zone to provide either heating or cooling year round to meet the needs of those independent spaces. To provide ventilation air to these temperature control zones with this system, fresh air will be brought into the air handling unit for conditioning year round.
3. New exhaust air fans and ductwork will be provided to serve the needs of the Restroom and Dental Laboratory. The Dental Laboratory requires 12 air changes per hour of ventilation air and is designed under negative air pressure.
4. A new waste and vent plumbing system will be provided at the first floor and second floor levels to serve the bathroom fixtures, laboratory sink, dental operator sinks, and dental operator dental units.
5. An existing mini-split air conditioning unit for cooling the data servers will be re-used in the first floor Data/Comm Room.
6. A new direct digital control (DDC) system will be provided to serve the new mechanical systems installed as part of this project. The new DDC system shall be an extension of the existing Trane Tracer Summit System and shall be integrated into the campus-wide energy management system. New DDC controls shall be provided for air handling unit AHU-2, the two existing hot water heating systems, return fans serving AHU-2, the new exhaust fans, VAV terminal units, and perimeter fintube heat.

7. Complete new supply air, return air, and exhaust air distribution systems for the VAV air handling system will be provided. The supply air system upstream of the terminal units will be of the medium pressure (4-inches WC) design with duct velocities up to 2,500 FPM. The supply air downstream of the terminal units, the return air ductwork, and the exhaust air ductwork will be of the low pressure design (2-inches WC). The return distribution system will be ducted throughout the second floor level.
8. New domestic cold water and domestic hot water will serve the new plumbing fixtures. Domestic cold water, domestic hot water, and domestic hot water circulation lines will be run from the existing pipe chase and distributed to the restroom fixtures, laboratory sink, dental sinks, and dental operator chairs. The Dental Clinic will be providing a new water filtering system for the domestic water serving the dental operator chairs. Domestic hot water will originate from the existing steam fired instantaneous water heater in the first floor of Building B71.
9. The water closet in the restroom will be floor-mounted and designed to meet the requirements of the Americans with Disabilities Act. The flushometers will be sensor operated and hard wired to the building electrical system. The restroom lavatory will be furnished with a sensor operated faucet mounted in a wall hung vitreous china lavatory. Stainless steel sinks will be provided in the laboratory and dental operatories. The faucet for the laboratory shall be a double handled style for manual operation. The dental operatories will each have foot pedal operated faucets for hands free operation.
10. The existing front entry is currently served by hot water fintube radiation. This piece of equipment will remain in place.
11. New dental gas systems include dental air and dental vacuum services. The existing dental air compressors and vacuum pumps currently located in the first floor of Building 71 will be re-used to serve the new Dental Clinic in Building B9. The existing dental vacuum storage tanks will be relocated to the first floor of Building B9. New vacuum and compressed air piping will be routed over from Building 71 to Building B9 for connection to the dental equipment.
12. A new waste and vent plumbing system will be provided to serve the new plumbing fixtures required as part of the Dental Clinic Renovation.
13. Design of HVAC controls and EMCS shall incorporate the building automation and control networking protocol. The controls shall be the Trane Tracer Summit System. All mechanical spaces shall have one or more Direct Digital Controllers (DDC) for monitoring and control of air handling units; return fans; exhaust fans; existing building hot water heating systems including pumps and heat exchangers; variable air volume terminal units; and existing domestic hot water heaters.
14. All control schemes shall be designed per the basic requirements of Department of Veterans Affairs HVAC Design Manual. Each heating hot water system and air handling unit system shall have a drawing schematic of the particular system with a detailed sequence of operation, system input/output points (IO) schedule, and EMCS system architecture drawings.
15. The specification for the direct digital temperature controls and EMCS is Section 23 09 23 DIRECT DIGITAL CONTROL SYSTEM FOR HVAC.
16. Monitoring of HVAC equipment operation shall as a minimum provide temperature, flow, high/low limits, trend logs, and alarms. EMCS details and points to be monitored shall be detailed on the same drawings as the temperature controls system. System I/O summaries shall be detailed. I/O summaries shall provide the necessary level analog input, analog output, digital input, digital output, alarm requirements, failure modes, etc., for all systems.

17. The specifications for the direct digital controls and EMCS work shall include all requirements for equipment and services, including software database programming, graphics generation, calibration, and end-to-end testing of the central console CPU and the facility remote DDC panels.
18. An existing campus-wide Energy Monitoring and Control System (EMCS) is in use at the site. Provisions shall be made to connect this new facility to the central EMCS via a network connection. Point programming and graphical design shall be performed to insure this new facility is data compatible with the existing central EMCS system.
19. Control panels, sensors, actuators, and devices shall be manufactured by Trane, Inc. No other product will be acceptable.
20. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS, contains instructions and engineering requirements relating to the testing, adjusting, and balancing requirements of the new mechanical HVAC systems. The work required by this section shall be complete, including all test and inspection reports, before starting the EMCS field tests.
21. Balancing Firm Qualifications: Testing, Adjusting, and Balancing shall be performed by an independent firm using certified technicians. Technicians shall be certified by the National Environmental Balancing Bureau (NEBB) or the Associated Air Balance Council (AABC). The firm shall select AABC MN-1 or NEBB TABES as the standard for providing testing, adjusting, and balancing of the mechanical systems. TAB can be performed only after each system is complete, including installation and operation of controls; and all aspects of the facility that have any bearing on the HVAC systems, including installation of ceilings, walls, windows, door, and partitions, are complete. All items such as ductwork and piping, terminal connections, etc., necessary to perform TAB shall be complete during the system readiness check.
22. The contractor shall provide Commissioning of the mechanical systems in accordance with Specification Sections 01 91 00, GENERAL COMMISSIONING REQUIREMENTS; 23 08 00, COMMISSIONING OF HVAC; and 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS. The specifications provide for a commissioning process which shall include procedures and methods for documenting and verifying the performance of the mechanical systems so that systems operate in conformity with the design intent.
23. The entire HVAC System shall be commissioned. Documentation required by the specifications such as design documentation; commissioning plan; functional performance test procedures and check lists for equipment and systems; membership and roles of the commissioning team; commissioning schedule; and acceptance documentation shall be submitted to the Owner's representative.
24. Description of Plumbing Systems: The plumbing system consists of the domestic water distribution system, fixtures, and sanitary waste and vent system from connections within the new remodeled facility to connections within the existing building. The design of all plumbing systems shall comply with ICC IPC and Specification Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
25. The plumbing design shall be in accordance with the 2006 International Plumbing Code and the VA Plumbing Design Manual. The plumbing design shall provide domestic hot and cold water to the various plumbing fixtures. The plumbing system shall include drains, domestic soft cold water, sanitary waste and vent piping, pipe insulation, and hot water circulation pumps. Plumbing Systems shall be insulated according to Specification Section 22 07 11, PLUMBING INSULATION.
26. Domestic Water Systems: The domestic cold, hot, and hot water re-circulating systems shall connect to

the existing domestic risers in the building, with all new horizontal mains to serve the new fixtures associated with this renovation project. The domestic water system shall be protected from back flow and back siphonage by a code compliant, lead free, reduced pressure principle back-flow prevention device or exposed vacuum breakers at the appropriate plumbing fixtures in accordance with ICC IPC.

27. Plumbing Fixtures: Fixtures shall meet the operational and dimensional requirements of ASME A112.19.2M and be provided with CP brass trim and individual stop valves. All water closets shall be provided with low-flow water conserving flushometers. All faucet fittings shall be furnished with a "Water Saver" products label. Provide fixtures that meet the requirements of the ADA/ABA.
28. A completely new dental gas system will be required for this facility, since VA Standards require that dental gas systems and medical gas systems be entirely separate in their origin and not cross connected. Dental air and vacuum are required. The existing dental vacuum pumps and dental air compressors currently located in the first floor of Building 71 will remain in place and be used to serve the new Dental Clinic in Building B9. The vacuum storage tanks will be relocated to Building B9 and placed in a first floor storage room.
29. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the dental gas piping testing indicated; that is a member of the Medical Gas Professional Healthcare Organization or is an NRTL as defined by OSHA in 29 CFR 1910.7; and that is acceptable to authorities having jurisdiction.

#### **Building Occupant and O&M Personnel Requirements**

1. The facility shall be operated and maintained by the Sheridan VAMC Facilities Staff. The Facilities Staff operates and maintains all buildings at Sheridan VAMC. O&M requirements, including personnel training requirements, are covered in the individual technical specification sections.

**SECTION 02 41 00  
DEMOLITION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies demolition and removal of portions of buildings, utilities, and other structures as shown.

**1.2 RELATED WORK:**

- A. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Asbestos Removal: Section 02 82 13, ASBESTOS REMOVAL AND DISPOSAL.
- E. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- F. Construction Waste Management: Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT.
- G. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7, INFECTION PREVENTION MEASURES.

**1.3 PROTECTION:**

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

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

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

1. No wall or part of wall shall be permitted to fall outwardly from structures.
2. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
3. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.

G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center; any damaged items shall be repaired or replaced as approved by the Resident Engineer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have Resident Engineer's approval.

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

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

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

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

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

- A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:
  - 1. As required for installation of new utility service lines.
  - 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Contractor shall dispose of debris in compliance with applicable federal, state or local permits, rules and/or regulations.
- C. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Resident Engineer. When utility lines are encountered that are not indicated on the drawings, the Resident Engineer shall be notified prior to further work in that area.

**3.2 CLEAN-UP:**

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

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**SECTION 02 82 13**  
**ASBESTOS REMOVAL AND DISPOSAL**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK:**

- A. The work covered by this Section includes furnishing all labor, equipment, materials, and transportation necessary for the proper and safe removal, handling, and disposal of asbestos containing/contaminated materials required for this project.
- B. Work areas known to contain asbestos are identified later in this Section. For any other areas suspected to contain asbestos which would be impacted by the work involved and are not previously identified in the scope, the Contractor shall notify the Contracting Officer who will secure bulk samples to be analyzed by an EPA-approved laboratory at no cost to the Contractor. Any additional areas identified as Asbestos Containing Materials (ACMs) (friable and/or non-friable) shall be approved for removal by the Contracting Officer.

**1.2 AVAILABLE ASBESTOS SURVEY REPORTS:**

- A. An Asbestos Verification and Lead-Based Paint Inspection Report was prepared for this project work area in February 2012. The complete report is included in Appendix B of these specifications.

**1.3 PROJECT SCOPE**

- A. The removal of asbestos containing materials (ACM's) by work area is as indicated in the following schedule:
  - 1. Black undercoating at sink in Storage 212. The entire sink shall be removed and disposed of.
- B. Field verification after the Report was issued has identified additional ACM's as follows, which shall be removed as part of this project:
  - 1. Thermal insulation at abandoned pipes concealed in vertical chases and horizontal soffits. Pipes and insulation shall be removed complete and disposed of after chase and soffit construction has been removed.

**1.4 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this Section to the extent that these publications are to be complied with. The publications are referred to in the text by basic designation only.
  - 1. TITLE 29, CODE OF FEDERAL REGULATIONS, US DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS. Part 1910.20, Access to Employee Exposure and Medical Records; Part 1910.95, Occupational Noise Exposure; Part 1910.13, Respiratory Protection; and Part 1926.1101, Asbestos.



2. TITLE 40, CODE OF FEDERAL REGULATIONS, U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) STANDARDS. Part 61, National Emission Standards for Hazardous Air Pollutants: Asbestos NESHP Revision, Final Rule; and Part 763, Asbestos Containing Materials in Schools, Final Rule and Notice.
3. TITLE 49, CODE OF FEDERAL REGULATIONS, U.S. DEPARTMENT OF TRANSPORTATION (DOT) STANDARDS. Part 171, Hazardous Substances; Part 172, Hazardous Materials, Final Rule; and Part 173, Shippers - General Requirements for Subpart M Shipments and Packaging.
4. APPLICABLE STATE ORDINANCES AND CODES.
5. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS. Z9.2-1979, Fundamentals Governing the Design and Operation of Local Exhaust Systems.
6. NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH) PUBLICATION. Manual of Analytical Methods, 3rd Edition, Volumes 1 and 2.
7. UNDERWRITERS LABORATORIES INC. (UL) PUBLICATION. 586-77 (R-1982), Test Performance of High Efficiency Particulate Air Filter Units.

#### **1.5 REQUIRED NOTIFICATIONS**

All applicable notifications should identify this project as a "Renovation" project. All notifications and permits are the sole responsibility of the Contractor. All notifications shall be submitted to all state, local and federal agencies. The Asbestos NESHP requires written notification of demolition or renovation activities regardless of the presence of asbestos containing material. The Contractor (through the Contracting Officer) shall coordinate the written "Notification of Demolition and Renovation" with Offutt AFB's Environmental Flight a minimum of ten (10) days prior to start of renovation activities.

#### **1.6 REVIEW OF ABATEMENT SCOPE BEFORE BIDDING**

The Contractor shall be responsible for performing all work and providing all materials required to achieve the work of this Section. The Government will not be responsible for any additional expense to the Contractor if the conditions causing those expenses could have been discovered in an on-site inspection prior to bid submittal.

#### **1.7 SAFETY**

Under government workplace safety regulations, the Contractor is responsible for the training of his employees. The Contractor is to ensure that its' employees and the Competent Person have completed all necessary Safety Training.

## **1.8 CONSTRUCTION DRAWINGS**

All drawings issued herein shall be used as reference and orientation only. The Contractor is required to check and verify all conditions at the site and shall assume full responsibility for the accuracy of the same.

## **1.9 UTILITIES**

- A. All electrical circuits and lights in or affected by asbestos control areas shall be de-energized. It is the Contractor's responsibility to provide labor or materials to maintain temporary power and lighting in the asbestos abatement areas and in areas of the building where operations may be affected by the removal. Temporary electrical service utilized in the enclosure shall be connected to ground fault-protected outlets located outside the enclosure.
- B. Connection to any water, gas and/or electricity shall be coordinated with and approved by the Contracting Officer. The cost of hookup or disconnection of any item of equipment either for test purposes or for use in construction shall be borne by the Contractor. The cost of the water, gas and electricity shall be borne by the Government. Any cost incurred for the hookup and disconnection of any existing utilities shall be borne by the Contractor.

## **1.10 OCCUPANCY**

The Contractor must provide for the continuing access to various parts of the building by authorized individuals. Signs, screens, temporary curtains, etc. shall be provided if necessary to maintain the routine business operations within and around the facility. The Contractor shall schedule his operations so that conflict and disturbance to facility operations are kept to a minimum.

## **1.11 HOUSEKEEPING**

Upon completion of the work, the Contractor shall remove from the building site all construction materials and rubbish resulting from his work.

## **1.12 ASBESTOS DISPOSAL**

Contractor shall dispose of all asbestos-containing and/or contaminated material in an EPA-approved landfill. The Government's asbestos-containing material shall not be mixed with asbestos-containing/contaminated waste generated by other entities. Manifests must reflect only material which was abated from this facility.

## **1.13 INSPECTION**

The Contracting Officer is authorized to call the attention of the Contractor to any failure of the work or materials to conform to the

provisions of the contract. The Contractor is responsible for all costs associated with re-inspections of failed work. The Inspector shall have the authority to reject materials or suspend the work until any questions at issue can be referred to and decided by the Contracting Officer. Costs associated with suspension of work, including but not limited to costs incurred by the Contracting Officer, the Government's third party Contractor(s) (if utilized), and the Contractor shall be borne by the Contractor.

#### **1.14 DAMAGES INCURRED**

- A. The Contractor shall take precautions and use extreme care to avoid damage to any of the building's furnishings, adjacent facilities, the building itself and any connected utilities, and carry out any necessary temporary and/or permanent repairs for which he is legally liable.
- B. The Contractor will be assessed the cost of any and all additional consulting, inspection, testing and analytical services incurred by the Government. These costs may include but are not limited to the following:
  - 1. Costs of all management and labor, both direct and indirect, to satisfactorily complete the project in excess of the number of work shifts identified by the Contractor.
  - 2. Expenses incurred by the Government if the Contractor fails to begin the project beyond the scheduled start date and the Contracting Officer is on-site.
  - 3. Expenses incurred by the Government if the work is suspended due to the Contractor's actions and the Contracting Officer is on-site.

#### **1.15 SUBMITTALS / CLOSE-OUT REQUIREMENTS**

- A. The Contractor shall submit data on the following items specified herein prior to start of work in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Prior to Start Submittals:
  - 1. NOTIFICATIONS, CERTIFICATIONS, AND LICENSE. The Contractor shall be responsible for obtaining a license as a business entity and certifications of all personnel in accordance with the appropriate State regulations regarding asbestos removal, handling, and disposal. At least ten (10) days prior to the commencement of any asbestos removal/demolition, the Contractor shall prepare written notification in accordance with EPA, 40 CFR, 763, Part 61, Subpart M, to the applicable State and City, if necessary.
    - a. Copies of this notification shall be forwarded to the appropriate EPA Regional Office.

- b. The Contractor shall submit copies of all of these notifications to the Contracting Officer not less than 5 working days prior to the start of asbestos abatement.
  - c. The Contractor shall submit copies of any local and/or state response letters they receive to the Contracting Officer no later than ten (10) days after receipt and prior to commencing any on-site work.
2. PROOF OF LICENSE AND CERTIFICATION. The Contractor shall submit proof to the Contracting Officer that they are licensed in the appropriate state prior to the start of asbestos abatement. The Contractor shall also submit proof that each employee who will be involved in this project is certified in that state in accordance with the above regulations. Proof of their certificates shall be submitted prior to the start of the project.
3. PROOF OF EMPLOYEE TRAINING AND MEDICAL EXAMINATION. Prior to the start of asbestos abatement, the Contractor shall submit proof to the Contracting Officer that:
- a. Employees and the Competent Person, as defined in 29 CFR 1926.1101, have been trained in accordance with the appropriate state regulations and as defined in all other applicable regulations.
  - b. The Competent Person will be continuously on-site during all asbestos abatement procedures.
  - c. The employees and the Competent Person have completed all medical examinations as required by the applicable regulations.
4. ASBESTOS REMOVAL PLAN. Prior to the start of asbestos abatement, the Contractor shall submit a written Asbestos Removal Plan as described below to be followed during the removal and disposal of asbestos-containing materials in this project, indicating all areas requiring asbestos abatement; a description of abatement procedures (including whether full containment will or will not be utilized); and an approximate duration (in working hours/days) for the abatement to occur in each area. Also include in the Plan information regarding employee training; medical examinations and fitness reports; personal protective equipment, such as respirators and clothing; employee decontamination; emergency procedures; pre-removal preparation, asbestos abatement and post-removal clean-up verification procedures; air monitoring, sampling and final clearance sampling; sequencing of asbestos-related work and the interfacing with other trades involved in construction; and waste storage and disposal. The Plan shall be submitted to the Contracting Officer for approval, which must be

granted prior to the start of work on each contaminated or assumed-to-be contaminated work site. Descriptions, drawings, and layouts of work site isolation enclosures and negative air pressure systems locations, decontamination and temporary waste storage facilities, and the boundaries of contaminated work areas shall also be provided for approval prior to the start of work as part of the Plan.

5. MISCELLANEOUS. Prior to the start of asbestos abatement, the Contractor shall submit the following:
  - a. Respiratory Protection Plan.
  - b. Project Contact List, to include phone numbers (cell and office) for all project supervisors and managers.

C. End of Project Close-Out:

1. TEST RESULTS. All Test Results will be made available to the Contracting Officer:
  - a. Air Sampling and Analysis: All costs associated with air monitoring and analysis and all OSHA personnel air monitoring requirements shall be borne by the Contractor.
  - b. Air Monitoring Results: Shall be reported to the Contracting Officer within 24 hours after the completion of a sampling period, with written results to be submitted to the Contracting Officer within five (5) working days. Test results shall indicate each sample's pump serial number, time weighted average (TWA) fiber count, pump start time, pump stop time, date, pump flow rate, and exact location of where the sample was taken.
2. WASTE MANIFESTS. The Contractor shall obtain a list of approved sanitary landfills for asbestos disposal from the EPA and/or applicable State regulatory agencies. Prior to the start of asbestos abatement, the Contractor shall submit to the Contracting Officer a copy of the written notification that was sent to the disposal site operator/owner of the intent to dispose of the asbestos-containing materials, including the estimated quantity and the tentative date for disposal. Upon completion of asbestos abatement, the Contractor shall submit proof to the Contracting Officer that all of the asbestos-containing materials have been disposed of in accordance with all applicable regulations. This shall include acknowledgment from the disposal site operator/owner in writing that the waste has been delivered in a manner and condition acceptable to the disposal site operator/owner.
3. SUPERVISOR'S LOGS. At the completion of all site work, the Contractor shall submit all pertinent documents pertaining to the project. Close-out documents should include, but not be limited to,

the following items: supervisor's logs; entry logs; notice of substantial completion; final project documentation; and Contractor's project job diary.

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**APPENDIX B**

**ASBESTOS VERIFICATION AND  
LEAD-BASED PAINT INSPECTION REPORT**



Billings, MT • Helena, MT • Missoula, MT • Seattle, WA

201 S. 30th Street  
Billings, Montana 59101  
Phone: 406/245-7766  
FAX: 406/254-1428

November 28, 2012

Mr. Steven Smith  
Kenneth Hahn Architects, Inc.  
1343 South 75<sup>th</sup> Street  
Omaha, NE 68124

RE: Letter Report  
Asbestos Verification and Lead-based Paint Inspection  
VA Building 9 - Administrative Area  
Sheridan, Wyoming  
Northern Project Number 999-1904

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Dear Mr. Smith:

This letter report provides the summarized results of the asbestos verification and lead-based paint inspection performed by Kevin Oliver (MTA-1308) and Mark Oliver (MTA-1792) of Northern Industrial Hygiene, Inc. (Northern) on January 18, 2012 at the above referenced site. The inspection was two-fold and included verifying and updating, if necessary, the asbestos information presented in a 2010 asbestos inspection and performing a full lead-based paint inspection to identify potential hazardous materials that may be present in this portion of the building. The inspections included the interior building materials located in the first floor Administrative Wing as well as in the basement, second floor and attic area of the building directly above and below this wing where the renovation project may impact those materials due to floor or ceiling penetrations. Other interior and all exterior building materials that are located elsewhere in the building were not included.

### **Overview of Building**

The structure is a two story office building that was constructed in 1909. It has a stone foundation, a full basement and an attic area that includes mechanical and other rooms. Exterior building walls are brick and the pitched roof is finished with slate or Transite® shingles. There are approximately 17,814 square feet of interior building space.

Typical interior building materials in the areas inspected include concrete, 12" x 12" vinyl tile or carpet finished floors; stone, brick, concrete masonry unit (CMU), plaster or gypsum board finished walls; and plaster, gypsum board or 2' x 4' lay-in panel finished ceilings. The plaster and gypsum board walls in the Administrative area have a spray-applied "splatter" texture present. Lower walls are finished with 6" vinyl cove base materials.

Typical interior painted building components in the areas inspected include gypsum board or plaster finished walls, plaster ceiling, metal door jambs, metal radiator covers, wood door jambs, wood window sashes, and brick or stone finished walls.

As stated above, exterior painted building components were not identified or tested as part of this investigation.



### **Asbestos Overview**

Asbestos is a trade name for a group of fibrous naturally occurring minerals that were used widely in building materials because of its ability to bind, resist chemicals, insulate, and fireproof. Exposure to elevated levels of asbestos fibers has been documented to cause a variety of diseases including asbestosis and cancer. Consequently, the application, removal, and disposal of asbestos-containing materials are regulated by several agencies.

Asbestos in most building materials poses little threat to human health as long as the asbestos fibers are securely bound within the building material. However, as the materials deteriorate because of time or exposure, or are disturbed because of human or other activities, the potential increases for the fibers to become airborne. When this occurs, the risk to human health increases significantly when the fibers are inhaled.

One definition for asbestos-containing building materials (ACBM), found in Environmental Protection Agency (EPA) regulations, (40 CFR, Part 763 - Asbestos Model Accreditation Plan and Section 202, Toxic Substance Control Act) is as follows:

- Friable asbestos-containing material containing more than one percent asbestos, which has been applied on ceilings, walls, structural members, piping, duct work, or any other part of a building, which when dry, may be crumbled, pulverized, or reduced to powder by hand pressure. The term includes non-friable asbestos-containing materials after it becomes damaged, by any means, such that when dry, it may be crumbled, pulverized, or reduced to powder by hand-pressure. This definition also includes flooring materials.

Another definition, found in Occupational Safety and Health Administration (OSHA) regulations, (29 CFR Parts 1910 and 1926) is slightly different as follows:

- Asbestos-containing materials are defined as being any material that contains more than one percent asbestos and also defines certain high-risk materials, which are presumed to contain asbestos, as Presumed Asbestos-containing Materials (PACM). The PACM designation applies to thermal system insulation, sprayed on or troweled on surfacing material and debris where such material is present. The PACM terminology was added to ensure compliance with the hazard communication provisions of the laws and specifically for buildings constructed prior to 1980.

### **Lead-Based Paint Overview**

Lead is found in the paint on the inside and outside of many buildings. Most buildings constructed prior to World War II had lead-based paint applied to the interior or exterior surfaces. Some paints introduced up until 1977 contained some level of lead. Regulations enforced by the Consumer Product Safety Commission banned the use of all but small amounts of lead in paints in 1978. However, manufacturers are still allowed to produce paints containing up to 600 parts per million lead.

Mr. Stephen Smith  
Hazardous Materials Inspection  
VA Building 9 Admin Area  
Sheridan, Wyoming  
February 28, 2012  
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If the paint which contains lead is in poor or damaged condition, persons working or living in the area can be exposed to small paint chips or lead-containing dust. Exposure can also result from construction, demolition, repair and refinish (sanding) operations or from the torch cutting or burning of painted materials.

Exposure to the lead can also occur as a result of hobbies or sports. Individuals who work with lead while making stained glass or while melting lead to make sinkers or bullets, or individuals that reload ammunition are all exposed to varying levels of lead.

### **Inspection Procedures**

#### ***Asbestos Sampling Procedures***

The asbestos survey was performed using the applicable portions of the currently recognized standard protocol developed for schools under AHERA, as promulgated in Title 40, Code of Federal Regulations (40 CFR), Part 763 and as amended in the Federal Register. Since the primary concern for this investigation was to identify potential asbestos hazards in the entire building, Northern representatives visually inspected existing conditions considering each construction, addition, or renovation date as separate, unique buildings, if applicable.

#### ***Laboratory Analysis of Bulk Asbestos Samples***

Bulk samples obtained during the inspection were assigned bulk sample numbers and entered on sample summary/chain-of-custody forms. The samples were transported to the laboratory by overnight courier under standard chain-of-custody procedures. The analysis was performed in accordance with EPA Method 600/R-93/116, which employs polarized light microscopic techniques with dispersion staining for identification of mineral forms of asbestos. The quantification of asbestos in the sample is intended to be an estimate only and the limit of detection for this method is approximately 1% by volume.

#### **Lead-Based Paint**

Testing of the painted surfaces was substantially performed by the primary recommended method for measuring the lead level in paint that is with a portable X-ray fluorescence instrument manufactured for paint analysis. Portable XRF instruments expose the painted surface to X-rays that causes lead to fluoresce with a characteristic frequency. The intensity of this fluorescence is measured by the instrument's detector and is then converted into a number that represents the amount of lead in the paint per unit area (milligrams per square centimeter). The XRF instrument has the capability to analyze the lead content of multiple layers of paint at one time. Laboratory analysis of paint-chip samples is recommended for components that cannot be tested using XRF instruments or to confirm inconclusive XRF results. Northern uses the XRF instrument manufactured by NITON Corporation. The machine is calibrated prior to, following and periodically during each days field-testing. All field data is stored electronically by the instrument for direct transfer to computer and is also recorded on field forms.

For labeling and definition purposes in this report, the term lead-based paint means paint or other surface coatings that contain lead equal to or greater than 1.0 mg/cm<sup>2</sup> as measured using an XRF. This definition is utilized by the Department of Housing and Urban Development (HUD) and does not specifically apply to exposure concerns under the Occupational Safety and Health Administration (OSHA). Because OSHA does not recognize a threshold of lead content in paint for personnel exposure concerns, the definition of lead-based paint in this report should be used only to discriminate paint with relatively high lead content from paint with relatively low lead content.

### **Inspection Findings**

During the 2010 asbestos inspection a total of eight (8) building materials suspected to contain asbestos were identified and sampled in the area of the structure being impacted by the planned renovation work. Northern collected additional samples of one (1) material, the plaster wall and ceiling system during this 2012 asbestos confirmation and update inspection to comply with EPA requirements. Laboratory analysis DID NOT find asbestos in the additional samples of plaster. One of the eight (8) originally identified building materials was previously confirmed to contain asbestos. That material is:

#### **M16.2 Black sink undercoating**

Seven (7) additional suspect materials; two types of flooring felt, gypsum board wall system, residual black flooring mastic, another 2' x 4' lay-in ceiling tile and a texture finish material present on both gypsum board and plaster walls, were identified during this 2012 asbestos confirmation and update inspection. These materials were sampled following sample collection requirements outlined under the EPA, AHERA legislation and State of Wyoming regulations. Laboratory results revealed that NONE of the newly identified and sampled materials contain asbestos.

For additional information refer to the 2010 asbestos inspection report, the attached Tables 1 and 2 and the attached 2012 asbestos laboratory analysis report.

### ***Lead-Based Paint***

This inspection focused on identifying general painted components in the designated areas of the interior of the building.

Ten (10) painted building components were identified in the portion of the building inspected of which five (5) were confirmed to contain lead paint. Confirmed lead-painted building components include:

- L3 Metal door jamb,
- L5 Wood door jamb,
- L7 Wood bead board,
- L8 Brick wall finish, and
- L10 Stone foundation wall.

All materials were in good condition at the time of the inspection.

Reference Tables 3 and 4 for a description of identified painted building components and XRF test results.

### **Conclusions and Recommendations**

#### ***Asbestos***

Asbestos was confirmed to be present in one suspect material, the black sink undercoating. If future renovation or demolition plans involve the removal of this asbestos-containing material Northern recommends that an accredited asbestos abatement contractor be retained to remove the entire sink from the cabinet, wrap it in two layers of six mil poly, attach necessary asbestos warning and waste generator labels and dispose the sink in a Class II landfill.

#### ***Lead-Based Paint***

Exposure to lead dust or fumes can result from construction, demolition, repair and refinish (sanding) operations or from the torch cutting or burning of painted materials. All of the lead-based paint painted components identified at the facility are in intact condition.

While no immediate concerns are noted for these components, renovation work can cause an impact on their condition and therefore their hazard potential.

### **Limitations**

This asbestos and lead-based paint inspection survey report was prepared based on information obtained during our on-site observations and interpretation of the XRF data as well as the laboratory results of bulk samples of building materials collected during the survey. The conclusions of this report are professional opinions based solely upon review of previously collected data, our visual site observations and interpretations of laboratory analyses and field data as described in our report.

This report has been prepared to provide information concerning the various types and estimated quantities of asbestos-containing materials present at this site. It includes only those materials that were visible and accessible at the time of our inspection. We did not remove any permanent building enclosures or disassemble any equipment.

This inspection report is intended to identify asbestos-containing materials and lead-based paint building components. It is not intended to be used for the purpose of obtaining bids for their removal by abatement contractors. The scope of services performed by Northern may not be appropriate to satisfy the needs of other users, and any use or re-use of this document, or the findings presented herein, is at the sole risk of the user.

Mr. Stephen Smith  
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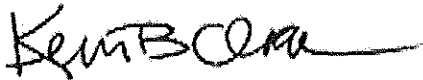
Our opinions are intended exclusively for use by Kenneth Hahn Architects, Inc. The opinions presented herein apply to the site conditions existing at the time of our investigation. Therefore, our opinions and recommendations may not apply to future conditions that may exist at the site that we have not had the opportunity to evaluate.

We trust this summary report provides sufficient information for planning purposes. We appreciate the opportunity to assist you and look forward to continuing to work with you.

It was a pleasure to assist you with this project. Please call if you have any questions on our report, or if you need any additional assistance.

Respectfully submitted,

NORTHERN INDUSTRIAL HYGIENE, INC.

A handwritten signature in black ink, appearing to read "Kevin Oliver", with a long horizontal flourish extending to the right.

Kevin Oliver, P.E. (Montana)

Attachments: Tables 1-4  
Laboratory Analysis Report  
Inspector Credentials  
Invoice

**TABLE 1**  
**SUMMARY OF MATERIALS SUSPECTED TO CONTAIN ASBESTOS**  
**AND LABORATORY RESULTS**  
**VA BUILDING 9 - ADMINISTRATIVE AREA**  
**SHERIDAN, WYOMING**

Material Number	Material Description	Original / Add. Samples	Laboratory Results
<b>2010 Asbestos Inspection</b>			
F03.C	12" x 12' Floor Tile - Light Grey with Black and Light Grey Splotches with Tan Adhesive	3 / 0	All Layers ND
M06.A	Plaster Wall and Ceiling Finish System	4 / 3	All Layers ND
F07.A	Carpet Adhesive - Tan	4 / 0	Tan Adhesive ND
M10.A	2' x 4' Lay-in Ceiling Tile - Random Pattern	3 / 0	ND
M10.B	2' x 4' Lay-in Ceiling Tile - Acoustic Random Pin Point	3 / 0	Tan Adhesive ND
M11.A	Caulking, Wall Penetrant, Brick Red Fire Stop	1 / 0	ND
M14.A	Baseboard - Slate Grey with Tan Adhesive	3 / 0	All Layers ND
M16.B	Sink Undercoating - Black	1 / 0	2% Chrysotile Asbestos
<b>2012 Asbestos Re-inspection</b>			
F03.E	12" x 12' Floor Tile - Dark Grey with Charcoal Spots with Tan Adhesive	0 / 3	All Layers ND
F05.A	Grey Flooring Felt	0 / 3	ND
F05.B	Black Flooring Paper	0 / 3	ND
F06.A	Residual Black Flooring Mastic	0 / 3	ND
M03.B	Gypsum Board Wall System	0 / 3	All Layers ND
M10.C	2' x 4' Lay-in Ceiling Tile - Pinholes and Short Fissures	0 / 3	ND
SO1.A	"Splatter Look" Wall Texture	0 / 3	All Layers ND

NS = Material Not Sampled

ND = No Asbestos Detected

**TABLE 2**  
**SUMMARY OF CONFIRMED ASBESTOS-CONTAINING MATERIALS\***  
**AND RECOMMENDED RESPONSE ACTION**  
**VA BUILDING 9 - ADMINISTRATIVE AREA**  
**SHERIDAN, WYOMING**

Material Number	Material Description	NESHAP Category	Recommended Response Action
M16.B	Sink Undercoating - Black	II	Retain Asbestos Contractor to Remove if Renovation or Demolition Work will Impact the Material

**\*Only interior building materials located in planned renovation area were included in this inspection report**

Category I	Nonfriable ACM such as packings, gaskets, resilient floor covering, and asphalt roofing products.
Category II	All nonfriable ACM, excluding Category I materials.
RACM	Friable ACM; Category I material that has become friable; Category I material that will be subjected to sanding, grinding, cutting, or abrading; or Category II, material that has a high probability of becoming friable.

**TABLE 3**  
**IDENTIFIED PAINTED BUILDING COMPONENTS and XRF SCREENING RESULTS**  
**VA BUILDING 9 - ADMINISTRATIVE AREA**  
**SHERIDAN, WYOMING**

Material Number	Building Component	Substrate	Color (at time of survey)	Material Condition	Screening Result*
L1	Wall	Gypsum Board	White	Intact	Negative
L2	Wall	Plaster	White	Intact	Negative
L3	Door Jamb	Metal	Gray	Intact	Pos/Neg
L4	Radiator Cover	Metal	Tan	Intact	Negative
L5	Door Jamb	Wood	Gray	Intact	Positive
L6	Window Sash	Wood	White	Intact	Negative
L7	Ceiling Bead Board	Wood	White	Intact	Positive
L8	Wall	Brick	Blue	Intact	Positive
L9	Ceiling	Plaster	Green/Blue	Intact	Negative
L10	Wall	Stone	White	Intact	Positive

\* Pos = Lead-based paint - equal to or greater than 1.0 mg/cm<sup>2</sup> measured using XRF screening.

\* Neg = Nonlead-based paint - less than 1.0 mg/cm<sup>2</sup> measured using XRF screening.

\*\* Reference Table 4 and drawings for locations of confirmed materials.



**TABLE 4**  
**Results of XRF Instrument Paint Testing**  
**VA BUILDING 9 - ADMINISTRATIVE AREA**  
**SHERIDAN, WYOMING**

Site	Insp.	Floor	Room	Side	Read. No	Mat. No.	Component	Feature	Substrate	Color	Cond.	Depth Index	PbC	Result
Bldg. 9	KO	N/A	N/A	N/A	245	N/A	Calibration	N/A	N/A	N/A	N/A	N/A	1.8	N/A
Bldg. 9	KO	N/A	N/A	N/A	246	N/A	Calibration	N/A	N/A	N/A	N/A	2.2	< LOD	Negative
Bldg. 9	KO	N/A	N/A	N/A	247	N/A	Calibration	N/A	N/A	N/A	N/A	1.11	1.1	Positive
Bldg. 9	KO	N/A	N/A	N/A	248	N/A	Calibration	N/A	N/A	N/A	N/A	1.03	< LOD	Negative
Bldg. 9	KO	N/A	N/A	N/A	249	N/A	Calibration	N/A	N/A	N/A	N/A	1.29	3.7	Positive
Bldg. 9	KO	Basement	b01	N/A	250	L9	Ceiling	ceiling	Plaster	Green	Intact	5.87	< LOD	Null
Bldg. 9	KO	Basement	b01	N/A	251	L9	Ceiling	ceiling	Plaster	Green	Intact	2.73	< LOD	Null
Bldg. 9	KO	Basement	b01	N/A	252	L9	Ceiling	ceiling	Plaster	Green	Intact	4.22	0.28	Null
Bldg. 9	KO	Basement	b01	N/A	253	L9	Ceiling	ceiling	Plaster	Green	Intact	4.66	< LOD	Negative
Bldg. 9	KO	Basement	b02	N/A	254	L9	Ceiling	ceiling	Plaster	Green	Intact	1.45	< LOD	Null
Bldg. 9	KO	Basement	b02	N/A	255	L9	Ceiling	ceiling	Plaster	Green	Intact	4.74	0.21	Negative
Bldg. 9	KO	Basement	b03	N/A	256	L9	Ceiling	ceiling	Plaster	Blue	Intact	1.2	< LOD	Negative
Bldg. 9	KO	Basement	b03	D	257	L8	Wall, Int.	ceiling	Brick	Blue	Intact	10	1.9	Positive
Bldg. 9	KO	Basement	b03	B	258	L8	Wall, Int.	ceiling	Brick	White	Intact	10	1.9	Positive
Bldg. 9	KO	Basement	b03	C	259	L10	Wall, Int.	ceiling	stone	White	Intact	10	< LOD	Positive
Bldg. 9	KO	Basement	b01	C	260	L10	Wall, Int.	ceiling	Drywall	Green	Intact	5.44	< LOD	Negative
Bldg. 9	KO	First	205	B	261	L2	Wall, Int.	wall	Plaster	White	Intact	10	< LOD	Negative
Bldg. 9	KO	First	205	A	262	L2	Wall, Int.	wall	Plaster	White	Intact	10	0.8	Null
Bldg. 9	KO	First	205	D	263	L1	Wall, Int.	wall	Drywall	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	200a	A	264	L2	Wall, Int.	wall	Plaster	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	200a	C	265	L2	Wall, Int.	wall	Plaster	White	Intact	10	< LOD	Negative
Bldg. 9	KO	First	206	A	266	L2	Wall, Int.	wall	Plaster	White	Intact	2.72	< LOD	Negative
Bldg. 9	KO	First	206	C	267	L2	Wall, Int.	wall	Plaster	White	Intact	2.81	< LOD	Negative
Bldg. 9	KO	First	207	C	268	L2	Wall, Int.	wall	Plaster	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	207	A	269	L2	Wall, Int.	wall	Plaster	White	Intact	2.76	< LOD	Negative
Bldg. 9	KO	First	208	A	270	L2	Wall, Int.	wall	Plaster	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	208	B	271	L2	Wall, Int.	wall	Plaster	White	Intact	4.53	< LOD	Negative
Bldg. 9	KO	First	208	C	272	L2	Wall, Int.	wall	Plaster	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	208	D	273	L1	Wall, Int.	wall	Drywall	White	Intact	1	< LOD	Negative

**TABLE 4**  
**Results of XRF Instrument Paint Testing**  
**VA BUILDING 9 - ADMINISTRATIVE AREA**  
**SHERIDAN, WYOMING**

Site	Insp.	Floor	Room	Side	Read. No	Mat. No.	Component	Feature	Substrate	Color	Cond.	Depth Index	PbC	Result
Bldg. 9	KO	First	210	B	274	L1	Wall, Int.	wall	Drywall	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	210	D	275	L1	Wall, Int.	wall	Drywall	White	Intact	2.7	< LOD	Negative
Bldg. 9	KO	First	210	A	276	L2	Wall, Int.	wall	Plaster	White	Intact	3.8	0.29	Negative
Bldg. 9	KO	First	210	C	277	L2	Wall, Int.	wall	Plaster	White	Intact	4.83	0.28	Negative
Bldg. 9	KO	First	209	B	278	L1	Wall, Int.	wall	Drywall	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	209	C	279	L1	Wall, Int.	wall	Drywall	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	209	D	280	L1	Wall, Int.	wall	Drywall	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	209	A	281	L2	Wall, Int.	wall	Plaster	White	Intact	3.14	0.21	Negative
Bldg. 9	KO	First	208	C	282	L4	Radiator	wall	Metal	Beige	Intact	1.59	< LOD	Negative
Bldg. 9	KO	First	206	A	283	L3	Door, Int.	Jamb Rt	Metal	Beige	Intact	10	< LOD	Positive
Bldg. 9	KO	First	207	C	284	L3	Door, Int.	Jamb Rt	Metal	Beige	Intact	1	< LOD	Negative
Bldg. 9	KO	First	205	C	285	L3	Door, Int.	Jamb Rt	Metal	Beige	Intact	1	< LOD	Negative
Bldg. 9	KO	First	209	C	286	L3	Door, Int.	Jamb Rt	Metal	Grey	Intact	1	< LOD	Negative
Bldg. 9	KO	First	210	B	287	L3	Door, Int.	Jamb Rt	Metal	Grey	Intact	1	< LOD	Negative
Bldg. 9	KO	First	208	D	288	L3	Door, Int.	Jamb Rt	Wood	Grey	Intact	3.04	< LOD	Positive
Bldg. 9	KO	First	c218	D	289	L7	Ceiling	bead board	Wood	White	Intact	2.3	< LOD	Positive
Bldg. 9	KO	First	c218	A	290	L2	Wall, Int.		Plaster	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	c218	C	291	L2	Wall, Int.		Plaster	White	Intact	1.57	< LOD	Negative
Bldg. 9	KO	First	c218	C	292	L6	Win., Int.	Sash, Lower	Wood	White	Intact	1	< LOD	Negative
Bldg. 9	KO	First	c218	A	293	L5	Door, Int.	Jamb Rt	Metal	White	Intact	6.16	< LOD	Positive
Bldg. 9	KO	First	N/A	A	294	N/A	Calibration	N/A	N/A	White	N/A	1	< LOD	Negative
Bldg. 9	KO	First	N/A	A	295	N/A	Calibration	N/A	N/A	White	N/A	1.2	1.2	Positive
Bldg. 9	KO	First	N/A	A	296	N/A	Calibration	N/A	N/A	White	N/A	1.13	1.1	Positive
Bldg. 9	KO	First	N/A	A	297	N/A	Calibration	N/A	N/A	White	N/A	1.05	< LOD	Negative
Bldg. 9	KO	First	N/A	A	298	N/A	Calibration	N/A	N/A	White	N/A	1.15	3.1	Positive
Bldg. 9	KO	First	N/A	A	299	N/A	Calibration	N/A	N/A	White	N/A	2.74	1.7	Positive



215 SW 153rd Street Burien, WA 98166  
OFFICE: (206) 988-1746 FAX: (206) 988-1978  
EMAIL: jcummings@bridgeband.com  
NVLAP Lab Code: 200511-0

1/25/2012

Mark Oliver

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-

RE: Bulk Asbestos Fiber Analysis; Batch # 12-00050  
Project Location *Sheridan VA Building 9*

Dear Mark Oliver,

Thank you for choosing Northern Industrial Hygiene, Inc. as your laboratory. Enclosed you will find analytical results for the bulk samples submitted to the laboratory.

Northern Industrial Hygiene is accredited by NVLAP Lab Code: 200511-0. Accreditation by NVLAP does not indicate endorsement by NVLAP or any other government agency. All bulk samples are analyzed in accordance with U.S. EPA Method -600/M4-82-020, December 1982 and EPA Method 600/R-93-116, July 1993. "Method for Determination of Asbestos in Bulk Building Materials"(NESHAP, 40 CFR-Part 61) protocol.

Analysis is cross checked through our inter or intra laboratory quality assurance program for verification. The percent values reported are based on calibrated visual estimates by volume unless verification by Point Count is indicated. Test results reported relate only to the samples submitted by the customer to Northern Industrial Hygiene, Inc. Trace amounts of asbestos are below the limit of detection and asbestos fibers with diameters below approximately 0.25 micrometers are not detectable with the Polarized Light Microscopy (PLM) analytical procedure. A trace amount of asbestos is defined as one to five fibers in three slide mounts. Asbestos found in this amount will be reported as "< 1.0%" by PLM analysis.

This report is highly confidential and shall not be reproduced without your written approval and the written approval of Northern Industrial Hygiene, Inc.

Samples are archived for thirty (30) days following analysis. Please contact us if samples need to be archived longer than the standard holding time.

Thank you for using Northern Industrial Hygiene, Inc. If you have any questions or concerns please contact us.

Sincerely,

Jude Cummings  
Laboratory Manager

Enclosure: Bulk Sample Results



215 SW 153rd Street Burien, WA 98166  
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NVLAP Lab Code: 200511-0

## Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-  
Project Location: Sheridan VA Building 9

NIH Batch Number: 12-00050  
Client Job Number: 999-1904  
Turn Around Time: 5 Day  
Samples Analyzed: 24

Client Sample Number: F03.E-1 Lab Sample Number: 12-00050.0001  
Client Sample Description: 12" Vinyl Floor Tile- Dark Gray w/ Charcoal Spots  
Client Sample Location: Corridor 200  
Sample Comments: Checked If Sample Not Analyzed ☐

**Layer 1 Opaque sticky material**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	1% Cellulose	99% Filler and Binder

**Layer 2 Gray vinyl**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>		30% Aggregate 70% Vinyl Filler and Binder

**Layer 3 Blue and white compressed material**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	1% Cellulose	30% Fine Grains 69% Filler and Binder

Client Sample Number: F03.E-2 Lab Sample Number: 12-00050.0002  
Client Sample Description: 12" Vinyl Floor Tile- Dark Gray w/ Charcoal Spots  
Client Sample Location: Corridor 200  
Sample Comments: Checked If Sample Not Analyzed ☐

**Layer 1 Opaque sticky material**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>		100% Filler and Binder

**Layer 2 Gray vinyl**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>		30% Aggregate 70% Vinyl Filler and Binder

**Layer 3 Blue and white compressed material**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	5% Synthetic	95% Filler and Binder

(Sample results continued on next page.)

Sampled by: Mark Oliver  
Received by: Fermin Uribe  
Reviewed by: Jude Cummings

1/18/2012  
1/24/2012  
1/25/2012

Jude Cummings, Laboratory Manager



215 SW 153rd Street Burien, WA 98166  
OFFICE: (206) 988-1746 FAX: (206) 988-1978  
NVLAP Lab Code: 200511-0

## Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-  
Project Location: *Sheridan VA Building 9*

NIH Batch Number: 12-00050  
Client Job Number: 999-1904  
Turn Around Time: 5 Day  
Samples Analyzed: 24

Client Sample Number: F03.E-3 Lab Sample Number: 12-00050.0003  
Client Sample Description: 12" Vinyl Floor Tile- Dark Gray W/ Charcoal Spots  
Client Sample Location: Corridor 200  
Sample Comments: Checked If Sample Not Analyzed ☐

**Layer 1 Gray vinyl**

<b>Asbestos Fibrous Components:</b> <b>No Asbestos Detected</b>	<b>Non-Asbestos Fibrous Components:</b>	<b>Non-Fibrous Components:</b>
		30% Aggregate
		70% Vinyl Filler and Binder

**Layer 2 Blue and white residue**

<b>Asbestos Fibrous Components:</b> <b>No Asbestos Detected</b>	<b>Non-Asbestos Fibrous Components:</b> 10% Synthetic	<b>Non-Fibrous Components:</b> 90% Filler and Binder
--	--	---

Client Sample Number: F05.A-1 Lab Sample Number: 12-00050.0004  
Client Sample Description: Gray Flooring Felt  
Client Sample Location: Room 409  
Sample Comments: Checked If Sample Not Analyzed ☐

**Gray fibrous material**

<b>Asbestos Fibrous Components:</b> <b>No Asbestos Detected</b>	<b>Non-Asbestos Fibrous Components:</b> 80% Cellulose 15% Synthetic	<b>Non-Fibrous Components:</b> 5% Filler and Binder
--	---	--

Client Sample Number: F05.A-2 Lab Sample Number: 12-00050.0005  
Client Sample Description: Gray Flooring Felt  
Client Sample Location: Room 409  
Sample Comments: Checked If Sample Not Analyzed ☐

**Gray fibrous material**

<b>Asbestos Fibrous Components:</b> <b>No Asbestos Detected</b>	<b>Non-Asbestos Fibrous Components:</b> 80% Cellulose 15% Synthetic	<b>Non-Fibrous Components:</b> 5% Filler and Binder
--	---	--

Client Sample Number: F05.A-3 Lab Sample Number: 12-00050.0006  
Client Sample Description: Gray Flooring Felt  
Client Sample Location: Room 409  
Sample Comments: Checked If Sample Not Analyzed ☐

(Sample results continued on next page.)

Sampled by: Mark Oliver  
Received by: Fermin Uribe  
Reviewed by: Jude Cummings

1/18/2012  
1/24/2012  
1/25/2012

Jude Cummings, Laboratory Manager



215 SW 153rd Street Burlen, WA 98166  
OFFICE: (206) 988-1746 FAX: (206) 988-1978  
NVLAP Lab Code: 200511-0

## Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-  
Project Location: *Sheridan VA Building 9*

NIH Batch Number: 12-00050  
Client Job Number: 999-1904  
Turn Around Time: 5 Day  
Samples Analyzed: 24

### Gray fibrous material

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	75% Cellulose 10% Synthetic	15% Filler and Binder

Client Sample Number:	F05.B-1	Lab Sample Number: 12-00050.0007
Client Sample Description:	Black Flooring Paper	
Client Sample Location:	Room 406	
Sample Comments:		Checked If Sample Not Analyzed <input type="checkbox"/>

### Dark gray paper

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	92% Cellulose	8% Filler and Binder

Client Sample Number:	F05.B-2	Lab Sample Number: 12-00050.0008
Client Sample Description:	Black Flooring Paper	
Client Sample Location:	Room 406	
Sample Comments:		Checked If Sample Not Analyzed <input type="checkbox"/>

### Layer 1 Dark gray paper

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	88% Cellulose	12% Filler and Binder

Client Sample Number:	F05.B-3	Lab Sample Number: 12-00050.0009
Client Sample Description:	Black Flooring Paper	
Client Sample Location:	Room 406	
Sample Comments:		Checked If Sample Not Analyzed <input type="checkbox"/>

### Dark gray paper

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	88% Cellulose	12% Filler and Binder

Client Sample Number:	F06.A-1	Lab Sample Number: 12-00050.0010
Client Sample Description:	Residual Black Flooring Mastic	
Client Sample Location:	Room 211 A	
Sample Comments:	Materials distinguishable but inseparable	Checked If Sample Not Analyzed <input type="checkbox"/>

(Sample results continued on next page.)

Sampled by: Mark Oliver  
Received by: Fermin Uribe  
Reviewed by: Jude Cummings

1/18/2012  
1/24/2012  
1/25/2012

Jude Cummings, Laboratory Manager



215 SW 153rd Street Burien, WA 98166  
OFFICE: (206) 988-1746 FAX: (206) 988-1978  
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## Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-  
Project Location: *Sheridan VA Building 9*

NIH Batch Number: 12-00050  
Client Job Number: 999-1904  
Turn Around Time: 5 Day  
Samples Analyzed: 24

### Blue and white coating with tan paper and black asphalt

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	30% Cellulose	55% Filler and Binder
		15% Asphalt Filler and Binder

Client Sample Number:	F06.A-2	Lab Sample Number: 12-00050.0011
Client Sample Description:	Residual Black Flooring Mastic	
Client Sample Location:	Room 211	
Sample Comments:		Checked If Sample Not Analyzed <input type="checkbox"/>

### Blue, tan and black materials with tan paper

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	25% Cellulose	55% Filler and Binder
		20% Asphalt Filler and Binder

Client Sample Number:	F06.A-3	Lab Sample Number: 12-00050.0012
Client Sample Description:	Residual Black Flooring Mastic	
Client Sample Location:	Room 211 B	
Sample Comments:		Checked If Sample Not Analyzed <input type="checkbox"/>

### Blue, white and black material with tan paper

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	30% Cellulose	55% Filler and Binder
		15% Asphalt Filler and Binder

Client Sample Number:	M03.B-1	Lab Sample Number: 12-00050.0013
Client Sample Description:	Gypsum Board Wall System	
Client Sample Location:	Room 205	
Sample Comments:		Checked If Sample Not Analyzed <input type="checkbox"/>

(Sample results continued on next page.)

Sampled by: Mark Oliver  
Received by: Fermin Uribe  
Reviewed by: Jude Cummings

1/18/2012  
1/24/2012  
1/25/2012

Jude Cummings, Laboratory Manager



215 SW 153rd Street Burien, WA 98166  
OFFICE: (206) 988-1746 FAX: (206) 988-1978  
NVLAP Lab Code: 200511-0

## Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-  
Project Location: *Sheridan VA Building 9*

NIH Batch Number: 12-00050  
Client Job Number: 999-1904  
Turn Around Time: 5 Day  
Samples Analyzed: 24

**Layer 1 White compressed powder**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	3% Cellulose	97% Filler and Binder

**Layer 2 White paper**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	92% Cellulose	8% Filler and Binder

**Layer 3 Tan paper and white compressed powder**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	20% Cellulose 2% Fiberglass	78% Filler and Binder

Client Sample Number: M03.B-2  
Client Sample Description: Gypsum Board Wall System  
Client Sample Location: Room 208  
Sample Comments:

Lab Sample Number: 12-00050.0014

Checked If Sample Not Analyzed ☐

**Layer 1 White compressed powder**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	5% Cellulose	95% Filler and Binder

**Layer 2 White paper**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	98% Cellulose	2% Filler and Binder

**Layer 3 Tan paper and white compressed powder**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	22% Cellulose 3% Fiberglass	75% Filler and Binder

Client Sample Number: M03.B-3  
Client Sample Description: Gypsum Board Wall System  
Client Sample Location: Room 210  
Sample Comments:

Lab Sample Number: 12-00050.0015

Checked If Sample Not Analyzed ☐

(Sample results continued on next page.)

Sampled by: Mark Oliver  
Received by: Fermin Uribe  
Reviewed by: Jude Cummings

1/18/2012  
1/24/2012  
1/25/2012

Jude Cummings, Laboratory Manager





215 SW 153rd Street Burien, WA 98166  
OFFICE: (206) 988-1746 FAX: (206) 988-1978  
NVLAP Lab Code: 200511-0

## Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-  
Project Location: *Sheridan VA Building 9*

NIH Batch Number: 12-00050  
Client Job Number: 999-1904  
Turn Around Time: 5 Day  
Samples Analyzed: 24

**Layer 1 White compressed powder**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	1% Cellulose	99% Filler and Binder

**Layer 2 White paper**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	95% Cellulose	5% Filler and Binder

**Layer 3 Tan paper and white compressed powder**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	25% Cellulose 2% Fiberglass	73% Filler and Binder

Client Sample Number: M06.A-5  
Client Sample Description: Plaster Wall & Ceiling System  
Client Sample Location: Corridor 200 A  
Sample Comments:

Lab Sample Number: 12-00050.0016

Checked If Sample Not Analyzed ☐

**Layer 1 Layers of paint and white compressed powder**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	1% Cellulose	10% Paint 89% Filler and Binder

**Layer 2 Off-white compressed gritty material**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	3% Hair	25% Aggregate 30% Vermiculite 42% Filler and Binder

Client Sample Number: M06.A-6  
Client Sample Description: Plaster Wall & Ceiling System  
Client Sample Location: Corridor 218  
Sample Comments:

Lab Sample Number: 12-00050.0017

Checked If Sample Not Analyzed ☐

(Sample results continued on next page.)

Sampled by: Mark Oliver  
Received by: Fermin Uribe  
Reviewed by: Jude Cummings

1/18/2012  
1/24/2012  
1/25/2012

Jude Cummings, Laboratory Manager



215 SW 153rd Street Burien, WA 98166  
OFFICE: (206) 988-1746 FAX: (206) 988-1978  
NVLAP Lab Code: 200511-0

## Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-  
Project Location: *Sheridan VA Building 9*

NIH Batch Number: 12-00050  
Client Job Number: 999-1904  
Turn Around Time: 5 Day  
Samples Analyzed: 24

**Layer 1 Off-white paint and white compressed powder**

<b>Asbestos Fibrous Components:</b>	<b>Non-Asbestos Fibrous Components:</b>	<b>Non-Fibrous Components:</b>
<b>No Asbestos Detected</b>		22% Paint
		78% Filler and Binder

**Layer 2 Off-white compressed gritty material**

<b>Asbestos Fibrous Components:</b>	<b>Non-Asbestos Fibrous Components:</b>	<b>Non-Fibrous Components:</b>
<b>No Asbestos Detected</b>	4% Hair	25% Vermiculite
		30% Aggregate
		41% Filler and Binder

Client Sample Number: M06.A-7  
Client Sample Description: Plaster Wall & Ceiling System  
Client Sample Location: Room 210  
Sample Comments:

Lab Sample Number: 12-00050.0018

Checked If Sample Not Analyzed ☐

**Layer 1 Off-white gritty compressed material**

<b>Asbestos Fibrous Components:</b>	<b>Non-Asbestos Fibrous Components:</b>	<b>Non-Fibrous Components:</b>
<b>No Asbestos Detected</b>	3% Hair	30% Vermiculite
		30% Aggregate
		37% Filler and Binder

Client Sample Number: M10.C-1  
Client Sample Description: 2' X 4' Ceiling Panel- Pinholes & Short Fissures  
Client Sample Location: Room 103  
Sample Comments: Materials distinguishable but inseparable

Lab Sample Number: 12-00050.0019

Checked If Sample Not Analyzed ☐

**White paint and gray fibrous compressed material**

<b>Asbestos Fibrous Components:</b>	<b>Non-Asbestos Fibrous Components:</b>	<b>Non-Fibrous Components:</b>
<b>No Asbestos Detected</b>	30% Cellulose	2% Paint
	15% Mineral Wool and Beads	53% Filler and Binder

Client Sample Number: M10.C-2  
Client Sample Description: 2' X 4' Ceiling Panel- Pinholes & Short Fissures  
Client Sample Location: Room 103  
Sample Comments: Materials distinguishable but inseparable

Lab Sample Number: 12-00050.0020

Checked If Sample Not Analyzed ☐

(Sample results continued on next page.)

Sampled by: Mark Oliver  
Received by: Fermin Uribe  
Reviewed by: Jude Cummings

1/18/2012  
1/24/2012  
1/25/2012

Jude Cummings, Laboratory Manager



215 SW 153rd Street Burien, WA 98166  
OFFICE: (206) 988-1746 FAX: (206) 988-1978  
NVLAP Lab Code: 200511-0

## Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-  
Project Location: *Sheridan VA Building 9*

NIH Batch Number: 12-00050  
Client Job Number: 999-1904  
Turn Around Time: 5 Day  
Samples Analyzed: 24

### White paint and gray fibrous compressed material

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	30% Cellulose	5% Paint
	15% Mineral Wool and Beads	50% Filler and Binder

Client Sample Number:	M10.C-3	Lab Sample Number: 12-00050.0021
Client Sample Description:	2' X 4' Ceiling Panel- Pinholes & Short Fissures	
Client Sample Location:	Corridor 218	
Sample Comments:	Materials distinguishable but inseparable	Checked If Sample Not Analyzed <input type="checkbox"/>

### White paint and gray fibrous compressed material

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	30% Cellulose	3% Paint
	15% Mineral Wool and Beads	52% Filler and Binder

Client Sample Number:	S01.A-1	Lab Sample Number: 12-00050.0022
Client Sample Description:	"Splatter Look" Wall Texture	
Client Sample Location:	Room 207	
Sample Comments:		Checked If Sample Not Analyzed <input type="checkbox"/>

### Layer 1 Chunks of white compressed powder with white paint

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>		40% Paint
		60% Filler and Binder

### Layer 2 Tan paper

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	98% Cellulose	2% Filler and Binder

Client Sample Number:	S01.A-2	Lab Sample Number: 12-00050.0023
Client Sample Description:	"Splatter Look" Wall Texture	
Client Sample Location:	Room 208	
Sample Comments:		Checked If Sample Not Analyzed <input type="checkbox"/>

(Sample results continued on next page.)

Sampled by: Mark Oliver  
Received by: Fermin Uribe  
Reviewed by: Jude Cummings

1/18/2012  
1/24/2012  
1/25/2012

Jude Cummings, Laboratory Manager



215 SW 153rd Street Burlen, WA 98166  
OFFICE: (206) 988-1746 FAX: (206) 988-1978  
NVLAP Lab Code: 200511-0

## Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.  
201 South 30th Street  
Billings, MT 59101-  
Project Location: *Sheridan VA Building 9*

NIH Batch Number: 12-00050  
Client Job Number: 999-1904  
Turn Around Time: 5 Day  
Samples Analyzed: 24

**Layer 1 White paint and white lumpy powder**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>		30% Paint 70% Filler and Binder

**Layer 2 Tan paper**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	98% Cellulose	2% Filler and Binder

Client Sample Number: S01.A-3  
Client Sample Description: "Splatter Look" Wall Texture  
Client Sample Location: Room 209  
Sample Comments:

Lab Sample Number: 12-00050.0024

Checked If Sample Not Analyzed ☐

**Layer 1 White paint and white fibrous material**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	40% Cellulose	30% Paint 30% Filler and Binder

**Layer 2 Tan paper with white powdery residue**

Asbestos Fibrous Components:	Non-Asbestos Fibrous Components:	Non-Fibrous Components:
<b>No Asbestos Detected</b>	80% Cellulose	20% Filler and Binder

Sampled by: Mark Oliver  
Received by: Fermin Uribe  
Reviewed by: Jude Cummings

1/18/2012  
1/24/2012  
1/25/2012

Jude Cummings, Laboratory Manager

# Chain of Custody

Northern Industrial Hygiene, Inc.

201 S. 30th Street

Billings, Montana 59101

Phone: (406) 245-7766

Fax: (406) 254-1428

E-mail: moliver@bridgeband.com

Inspector/Contact: Mark Oliver

NIH Lab Batch ID: 12-00050	
Project Name: Sheridan VA-Bldg 9	
Project Number: 999-1904	
Date Samples Taken: 01-18-12	
Type of Analysis: PLM	
Turn Around Time Request: (check one)	
2 Hour:	
Same Day:	
24 Hour:	
5 Day:	X

For lab use only:	
Sample(s) size: Accept/Reject	Non-Conformance Memo: Y/N
Package Condition: Good/Damaged/Severe Damage	

Page: 1 of 2

NIH Lab ID	Sample Number	Sample Description	Sample Location
1	F03.E-1	12" Vinyl Floor Tile - Dark Gray w	Corridor 200
2	F03.E-2	Charcoal spots	↓ ↓
3	F03.E-3	↓ ↓ ↓	↓ ↓
4	F05.A-1	Gray Flooring Felt	Room 409
5	F05.A-2	↓ ↓ ↓	↓ ↓
6	F05.A-3	↓ ↓ ↓	↓ ↓
7	F05.B-1	Black Flooring Paper	Room 406
8	F05.B-2	↓ ↓ ↓	↓ ↓
9	F05.B-3	↓ ↓ ↓	↓ ↓
10	F06.A-1	Residual Black Flooring Mastic	Room 211A
11	F06.A-2	↓ ↓ ↓	Room 211
12	F06.A-3	↓ ↓ ↓	Room 211B
13	M03.B-1	Gypsum Board Wall System	Room 205
14	M03.B-2	↓ ↓ ↓	Room 208
15	M03.B-3	↓ ↓ ↓	Room 210
16	M06.A-5	Plaster Wall & Ceiling System	Corridor 200A
17	M06.A-6	↓ ↓ ↓	Corridor 218
18	M06.A-7	↓ ↓ ↓	Room 210
19	M10.C-1	2'x4' Ceiling Panel - Pinholes & Short	Room 103
20	M10.C-2	Fissures	Room 103
21	M10.C-3	↓ ↓ ↓	Corridor 218

Number of samples shipped this page: 21

Total number of samples shipped: 24

Special Instructions: Analyze group method - Stop at first positive in each group

Date: 01-19-12 Time: 11AM Relinquished by: Mark Oliver

Firm: NIH

Date: 01-19-12 Time: 11AM Received by: Priority Mail

Firm: USPS

Date: 01/24/12 Time: 0930 Received by: Jannan Wabe

Firm: NIH-BURIE

Revised 5/22/2007 JAC

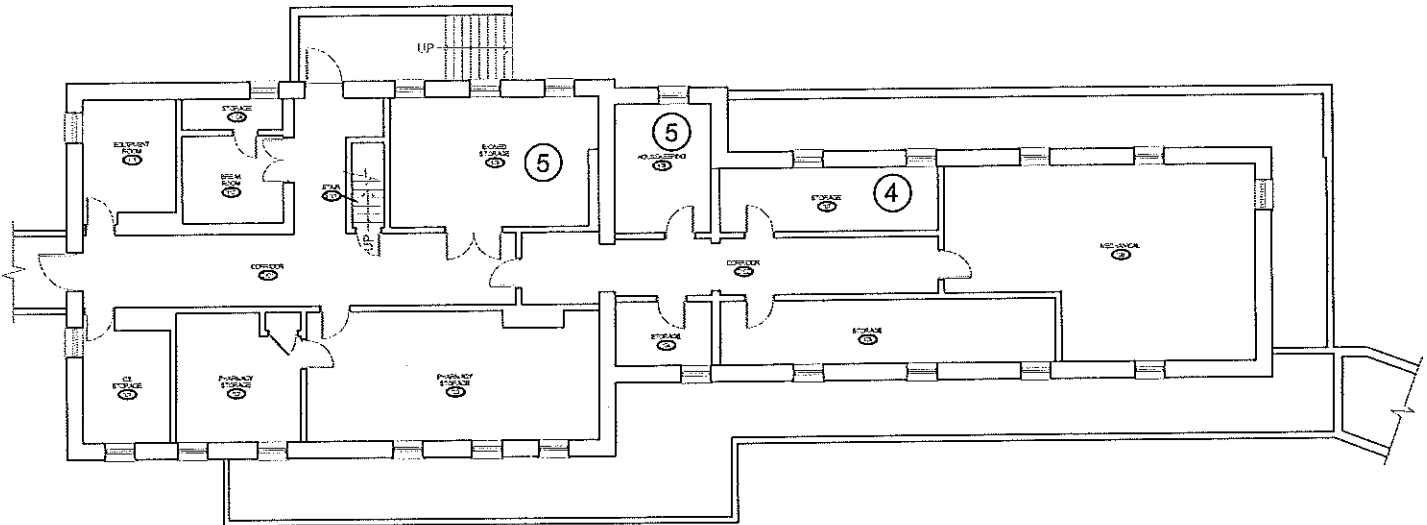
1/24/12

16:25 Analyzed: Julie Carr

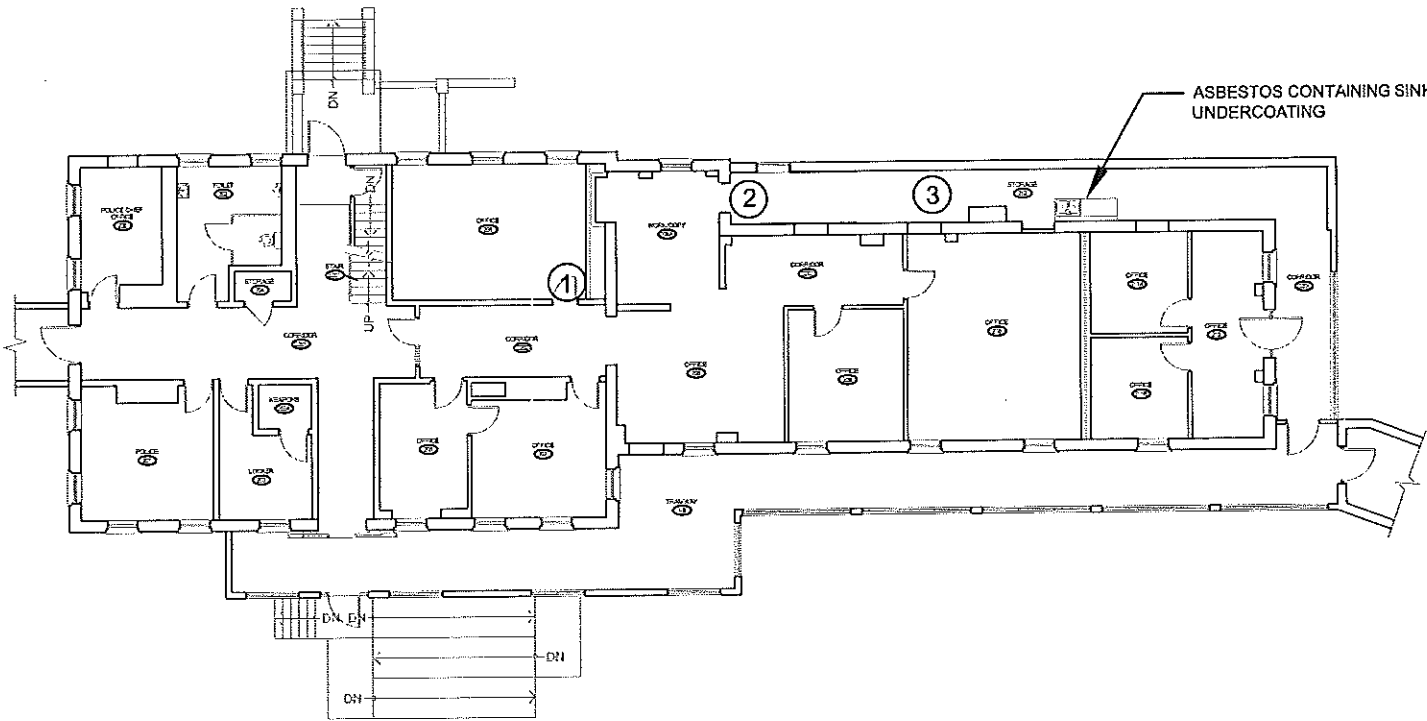
16:25 Analyzed Jude Camp

KEY NOTES

- ① L3 METAL DOOR JAMB
- ② L5 WOOD DOOR JAMB
- ③ L7 WOOD BEAD BOARD
- ④ L8 BRICK WALL FINISH
- ⑤ L10 STONE FOUNDATION WALL



BASEMENT FLOOR PLAN - BUILDING #9



FIRST FLOOR PLAN - BUILDING #9



DATE: 2/28/2012  
DRAWN BY: ZRF  
CHK BY: KBO  
CAD FILE: FIG. 1.1

PROJECT NAME: SHERIDAN VETERANS AFFAIRS MEDICAL CENTER  
ADDRESS: 1898 FORT ROAD  
SHERIDAN, WYOMING 82801  
NIH PROJECT NUMBER: 999-1904



FIG. 1.1: HAZARDOUS MATERIAL  
LOCATIONS - BASEMENT AND FIRST  
FLOORS - BUILDING #9

**MARK A OLIVER**

has met the requirements of Montana Administrative Rule 17.74.362  
and/or 17.74.363 for accreditation in the following asbestos-type  
occupation(s) as indicated by an expiration date(s).

MTA-1792

CS

MP

PD

IN

12/19/2012

07/12/2012

01/24/2013

WK

  
MT DEQ Asbestos Control Program



**KEVIN B OLIVER**

has met the requirements of Montana Administrative Rule 17.74.362  
and/or 17.74.363 for accreditation in the following asbestos-type  
occupation(s) as indicated by an expiration date(s).

MTA-1308

CS  
12/19/2012


MP

PD

07/12/2012

IN  
01/24/2013

WK

  
MT DEQ Asbestos Control Program

**SECTION 03 54 13**  
**GYPSUM CEMENT UNDERLAYMENT**

**PART 1 - GENERAL**

**1.1 SCOPE**

This Section covers gypsum cement underlayment installed over existing wood flooring as shown on the Drawings.

**1.2 QUALITY ASSURANCE**

- A. Installer shall be a licensed applicator of the manufacturer of specified gypsum cement underlayment, and shall use mixing, pumping, and water metering equipment approved by the manufacturer.
- B. Compressive Strength: Provide gypsum cement underlayment with a minimum compressive strength of 2,000 psi, per ASTM C472.
- C. Materials shall be delivered in their original, unopened packages, and protected from exposure to the elements after delivery. Do not allow bags to get wet.
- D. Certification: Upon completion of the work, and as a condition of its acceptance, contractor shall deliver to the architect a certificate from the manufacturer, and signed by the licensed applicator, stating that the material used in the work complies with the specified requirements.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Manufacturer's literature and data, showing details of installation of gypsum cement underlayment.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Gypsum Cement Underlayment: FIRM-FILL 3310, as supplied by Hacker Industries, Inc., (800) 642-3455, [www.hackerindustries.com](http://www.hackerindustries.com); or approved equal.
- B. Subfloor Primer: As approved by gypsum cement underlayment manufacturer.
- C. Sand: 1/8" or less washed plaster of masonry sand meeting the requirements of the gypsum cement underlayment manufacturer.
- D. Water: Potable and free from impurities.

**PART 3 - EXECUTION**

**3.1 CONDITION OF SUBFLOOR**

- A. Subfloor must be structurally sound (L/360), broom clean, dry and free from oil, grease, paraffin, laitance, or other contaminants.

- B. Before installation, the installer shall inspect and approve the condition of the subfloor and test for dryness.

### **3.2 PREPARATION OF SUBFLOOR**

- A. Leak Prevention: All cracks and voids should be filled with a quick setting patching, taping compound, or equal, where leakage may occur.
- B. Prime wood subfloors with one coat of primer, of type and coverage as recommended by the gypsum cement underlayment manufacturer.

### **3.3 MIXING INSTRUCTIONS**

- A. Gypsum cement underlayment mix proportions, designs, and methods shall be in strict accordance with manufacturer's written instructions.
- B. Do not overwater. Water amount will vary depending on wetness of sand.

### **3.4 GYPSUM CEMENT UNDERLAYMENT APPLICATION**

- A. Scheduling:
  - 1. Installation of gypsum cement underlayment shall not begin until the building is enclosed, including roof, windows, doors, and other openings.
  - 2. Gypsum cement underlayment shall be installed before the installation of gypsum board.
- B. Application:
  - 1. Thickness: As required to achieve a level floor.
  - 2. Install gypsum cement underlayment at specified thickness by placing bags, sand, and water into an approved high-speed mixing device and blend for a minimum of one minute, per manufacturer's written instructions.
  - 3. Place gypsum cement underlayment by pumping onto floor areas, spreading and screeding to a smooth surface.
  - 4. Place as continuously as possible until installation is complete, so that wet slurry is not placed against slurry which has obtained initial set, except at specified joints.
- C. Protection: After installation, temporary wood planking shall be placed over finished product wherever the gypsum cement underlayment will be subject to wheeled or concentrated loads.
- D. Drying: Before, during, and after installation of gypsum cement underlayment, building interior must be ventilated and heated to a minimum of 50-degree F to assure completion of the drying process. Provide continuous ventilation and adequate heat to rapidly remove moisture from the area until gypsum cement underlayment is dry. Do not install finished floor coverings until the gypsum cement underlayment is tested for dryness, per floor covering manufacturer's requirements.

### **3.5 PREPARATION FOR INSTALLATION OF FLOOR COVERINGS**

Sealing: Any areas where the gypsum cement underlayment surface has been damaged should be cleaned and sealed per floor covering manufacturer's written requirements.

### **3.6 FIELD QUALITY CONTROL**

- A. Slump Test: Gypsum cement underlayment shall be tested for slump at the beginning of each installation in order to establish required slump. Slump tests shall then be taken periodically during installation to verify that the required slump is maintained. Slump tests shall be conducted using a 2-inch x 4-inch cylinder. The acceptable patty size is 7-1/2-inches in diameter, plus or minus 1/2-inch. Comply with manufacturer's written requirements.
- B. Field Samples: Testing shall be done in accordance with modified ASTM C472 testing procedures, using 2-inch split brass molds.

- - - 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. Columns and lintels at removed masonry walls
  - 6. Loose lintels

**1.2 RELATED WORK**

- A. Prime painting: Section 09 91 00, PAINTING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
  - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
  - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
  - 3. Provide templates and rough-in measurements as required.

**1.4 QUALITY ASSURANCE**

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

**1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
  - B18.6.1-97.....Wood Screws

- B18.2.2-87(R2005).....Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
- A36/A36M-08.....Structural Steel
- A53-10.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated  
Welded and Seamless
- A123-09.....Zinc (Hot-Dip Galvanized) Coatings on Iron and  
Steel Products
- A307-10.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile  
Strength
- A391/A391M-07.....Grade 80 Alloy Steel Chain
- A653/A653M-10.....Steel Sheet, Zinc Coated (Galvanized) or Zinc-  
Iron Alloy Coated (Galvannealed) by the Hot-Dip  
Process
- A786/A786M-09.....Rolled Steel Floor Plate
- C1107-08.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- F436-10.....Hardened Steel Washers
- F468-10.....Nonferrous Bolts, Hex Cap Screws, and Studs for  
General Use
- F593-02(R2008).....Stainless Steel Bolts, Hex Cap Screws, and Studs
- F1667-11.....Driven Fasteners: Nails, Spikes and Staples
- D. American Welding Society (AWS):
- D1.1-10.....Structural Welding Code Steel
- D1.3-08.....Structural Welding Code Sheet Steel
- E. National Association of Architectural Metal Manufacturers (NAAMM)
- AMP 500-06.....Metal Finishes Manual
- F. Structural Steel Painting Council (SSPC)/Society of Protective Coatings:
- SP 1-04.....No. 1, Solvent Cleaning
- SP 2-04.....No. 2, Hand Tool Cleaning
- SP 3-04.....No. 3, Power Tool Cleaning

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Structural Steel: ASTM A36.
- B. Steel Pipe: ASTM A53.
1. Galvanized for exterior locations.
  2. Type S, Grade A unless specified otherwise.
  3. NPS (inside diameter) as shown.
- C. Primer Paint: As specified in Section 09 91 00, PAINTING.
- D. Grout: ASTM C1107, pourable type.

## **2.2 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.

## **2.3 FABRICATION GENERAL**

### **A. Material**

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

### **B. Size:**

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

### **C. Connections**

1. Except as otherwise specified, connections may be made by welding, riveting or bolting.
2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.

6. Use rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members; machine screws or bolts.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal 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. 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.
- 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. Steel and Iron: NAAMM AMP 504.
    - a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
    - b. Surfaces exposed in the finished work:
      - 1) Finish smooth rough surfaces and remove projections.
      - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
    - c. Shop Prime Painting:
      - 1) Surfaces of Ferrous metal:
        - a) Items not specified to have other coatings.
        - b) Galvanized surfaces specified to have prime paint.
        - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
        - d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
        - e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
      - 2) Non ferrous metals: Comply with MAAMM-500 series.
  - G. Protection:

1. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

## **2.4 SUPPORTS**

### **A. General:**

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

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

1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.
4. Steel hat channels where shown. Flange cut and flattened for anchorage to stud.

### **I. Columns and Lintels at Removed Masonry Walls:**

1. Fabricate of structural steel shapes as shown.
2. Drill for anchor bolts.

## **2.5 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. Provide bearing plates for lintels where shown.
- F. Weld or bolt upstanding legs of double angle lintels together with 19 mm (3/4 inch bolts) spaced at 300 mm (12 inches) on centers.

## **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. Field weld in accordance with AWS.
  - 1. Design and finish as specified for shop welding.
  - 2. Use continuous weld unless specified otherwise.
- C. 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.
- D. 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.
- E. Secure escutcheon plates with set screws.

### **3.2 INSTALLATION OF SUPPORTS**

- A. Anchorage to structure.
  - 1. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts, and to slabs with expansion bolts, unless shown otherwise.
  - 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.

### **3.3 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.

### **3.19 CLEAN AND ADJUSTING**

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

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**SECTION 06 10 00  
ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

Section specifies wood blocking, framing, sheathing, furring, nailers, rough hardware, and light wood construction.

**1.2 RELATED WORK:**

Milled woodwork: Section 06 20 00, FINISH CARPENTRY.

**1.3 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings showing framing connection details, fasteners, connections and dimensions.

**1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:**

- A. Protect lumber and other products from dampness both during and after delivery at site.
- B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.
- C. Stack plywood and other board products so as to prevent warping.
- D. Locate stacks on well drained areas, supported at least 150 mm (6 inches) above grade and cover with well ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

**1.5 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- B. American Forest and Paper Association (AFPA):  
National Design Specification for Wood Construction  
NDS-05.....Conventional Wood Frame Construction
- C. American Institute of Timber Construction (AITC):  
A190.1-07.....Structural Glued Laminated Timber
- D. American Society of Mechanical Engineers (ASME):  
B18.2.1-96(R2005).....Square and Hex Bolts and Screws  
B18.2.2-87.....Square and Hex Nuts  
B18.6.1-97.....Wood Screws  
B18.6.4-98(R2005).....Thread Forming and Thread Cutting Tapping Screws  
and Metallic Drive Screws
- E. American Plywood Association (APA):  
E30-07.....Engineered Wood Construction Guide

## F. American Society for Testing And Materials (ASTM):

A47-99(R2009).....Ferritic Malleable Iron Castings

A48-03(R2008).....Gray Iron Castings

A653/A653M-10.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

C954-10.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 inch (2.24 mm) to 0.112-inch (2.84 mm) in thickness

C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs

D143-09.....Small Clear Specimens of Timber, Method of Testing

D1760-01.....Pressure Treatment of Timber Products

D2559-10.....Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions

D3498-11.....Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems

F844-07.....Washers, Steel, Plan (Flat) Unhardened for General Use

F1667-08.....Nails, Spikes, and Staples

## G. Federal Specifications (Fed. Spec.):

MM-L-736C.....Lumber; Hardwood

## H. Commercial Item Description (CID):

A-A-55615.....Shield, Expansion (Wood Screw and Lag Bolt Self Threading Anchors)

## I. Military Specification (Mil. Spec.):

MIL-L-19140E.....Lumber and Plywood, Fire-Retardant Treated

## J. Truss Plate Institute (TPI):

TPI-85.....Metal Plate Connected Wood Trusses

## K. U.S. Department of Commerce Product Standard (PS)

PS 1-95.....Construction and Industrial Plywood

PS 20-05.....American Softwood Lumber Standard

**PART 2 - PRODUCTS****2.1 LUMBER:**

- A. Unless otherwise specified, each piece of lumber shall bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.
  - 1. Identifying marks in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
  - 2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.
- B. Structural Members: Species and grade as listed in the AFPA, National Design Specification for Wood Construction having design stresses as shown.
- 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. Framing lumber: Minimum extreme fiber stress in bending of 1100.
  - 3. Furring, blocking, nailers and similar items 100 mm (4 inches) and narrower Standard Grade; and members 150 mm (6 inches) and wider Number 2 Grade.
- 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. Mil. Spec. MIL-L-19140 with piece of treated material bearing identification of testing agency and showing performance rating.
  - 2. Treatment and performance inspection by an independent and qualified testing agency that establishes performance ratings.
- 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; and nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members used in connection with roofing and flashing materials.
3. Treat other members specified as preservative treated (PT).
4. Preservative treat by the pressure method complying with ASTM D1760, except any process involving the use of Chromated Copper arsenate (CCA) for pressure treating wood is not permitted.

## **2.2 PLYWOOD**

- A. Comply with Prod. Std. PS 1.
- B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type.
- C. Sheathing:
  1. APA rated Exposure 1 or Exterior, panel grade CD or better.

## **2.3 STRUCTURAL-USE PANELS**

- A. Comply with APA.
- B. Bearing the mark of a recognized association or independent agency that maintains continuing control over quality of panel which identifies compliance by end use, Span Rating, and exposure durability classification.
- C. Laminated Veneer Lumber (LVL):
  1. Bonded jointed wood veneers with ASTM D2559 adhesive.
  2. Scarf jointed wood veneers with grain of wood parallel.
  3. Size as shown.

## **2.4 ROUGH HARDWARE AND ADHESIVES:**

- A. Anchor Bolts:
  1. ASME B18.2.1 and ANSI B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.
  2. Extend at least 200 mm (8 inches) into masonry or concrete with ends bent 50 mm (2 inches).
- B. Miscellaneous Bolts, Expansion Bolts: C1D, A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Use 13 mm (1/2 inch) bolt unless shown otherwise.
- C. Washers
  1. ASTM F844.
  2. Use zinc or cadmium coated steel or cast iron for washers exposed to weather.

## D. Screws:

1. Wood to Wood: ANSI B18.6.1 or ASTM C1002.
2. Wood to Steel: ASTM C954, or ASTM C1002.

## E. Nails:

1. Size and type best suited for purpose unless noted otherwise. Use aluminum-alloy nails, plated nails, or zinc-coated nails, for nailing wood work exposed to weather and on roof blocking.
2. ASTM F1667:
  - a. Common: Type I, Style 10.
  - b. Concrete: Type I, Style 11.
  - c. Barbed: Type I, Style 26.
  - d. Underlayment: Type I, Style 25.
  - e. Masonry: Type I, Style 27.
  - f. Use special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 32 mm (1-1/4 inches) long, 8d and deformed or annular ring shank.

## F. Framing and Timber Connectors:

1. Fabricate of ASTM A446, Grade A, steel sheet not less than 1.3 mm (0.052 inch) thick unless specified otherwise. Apply standard plating to steel timber connectors after punching, forming and assembly of parts.
2. Framing Angles: Angle designed with bendable legs to provide three way anchors.
3. Straps:
  - a. Designed to provide wind and seismic ties with sizes as shown or specified.
  - b. Strap ties not less than 32 mm (1-1/4 inches) wide.
  - c. Punched for fastener.

## G. Adhesives:

1. For field-gluing plywood to lumber framing floor or roof systems: ASTM D3498.
2. For structural laminated Wood: ASTM D2559.

**PART 3 - EXECUTION****3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:**

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

1. AFPA National Design Specification for Wood Construction for timber connectors.
2. AFPA WCD-number 1, Manual for House Framing for nailing and framing unless specified otherwise.



3. APA for installation of plywood or structural use panels.

B. Fasteners:

1. Nails.

- a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA Manual for House Framing where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.
- b. Use special nails with framing connectors.
- c. For sheathing and subflooring, select length of nails sufficient to extend 25 mm (1 inch) into supports.
- d. Use eight penny or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
- e. Use 16 penny or larger nails for nailing through 50 mm (2 inch) thick lumber.
- f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.

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 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. Cut notch, or bore in accordance with NFPA Manual for House-Framing for passage of ducts wires, bolts, pipes, conduits and to accommodate other work. Repair or replace miscut, misfit or damaged work.
- D. Blocking Nailers, and Furring:
  - 1. Install furring, blocking, nailers, and grounds where shown.
  - 2. Use longest lengths practicable.
  - 3. Use fire retardant treated wood blocking where shown at openings and where shown or specified.
  - 4. Layers of Blocking or Plates:
    - a. Stagger end joints between upper and lower pieces.
    - b. Nail at ends and not over 600 mm (24 inches) between ends.
    - c. Stagger nails from side to side of wood member over 125 mm (5 inches) in width.

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**SECTION 06 20 00  
FINISH CARPENTRY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies exterior and interior millwork.
- B. Items specified.
  - 1. Interior wood trim materials
  - 2. Plastic laminate-clad cabinets
  - 3. Plastic laminate-clad countertops
  - 4. Solid polymer material countertops

**1.2 RELATED WORK**

- A. Framing, furring and blocking: Section 06 10 00, ROUGH CARPENTRY.
- B. Wood doors: Section 08 14 00, WOOD DOORS.
- C. Color and texture 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. Millwork items - Half full size scale for sections and details; 1:50 (1/4-inch) for elevations and plans.
  - 2. Show construction and installation.
  - 3. Solid polymer countertops
- C. Samples:
  - 1. Plastic laminate finished plywood or particleboard, 150 mm by 300 mm (six by twelve inches).
  - 2. Solid polymer material
- D. Certificates:
  - 1. Indicating preservative treatment of materials meet the requirements specified.
  - 2. Indicating moisture content of materials meet the requirements specified.
- E. List of acceptable sealers for preservative treated materials.
- F. Manufacturer's literature and data:
  - 1. Finish hardware
  - 2. Sinks with fittings
  - 3. Electrical components

**1.4 DELIVERY, STORAGE AND HANDLING**

- A. Protect lumber and millwork from dampness, maintaining moisture content specified both during and after delivery at site.

- B. Store finishing lumber and millwork in weathertight well ventilated structures or in space in existing buildings designated by Resident Engineer. Store at a minimum temperature of 21°C (70°F) for not less than 10 days before installation.
- C. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

### 1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Hardboard Association (AHA):  
A135.4-04.....Basic Hardboard
- C. Builders Hardware Manufacturers Association (BHMA):  
A156.9-03.....Cabinet Hardware  
A156.11-04.....Cabinet Locks  
A156.16-02.....Auxiliary Hardware
- D. National Particleboard Association (NPA):  
A208.1-99.....Wood Particleboard
- E. American Wood-Preservers' Association (AWPA):  
AWPA C1-03.....All Timber Products - Preservative Treatment by Pressure Processes
- F. Architectural Woodwork Institute (AWI):  
AWI-99.....Architectural Woodwork Quality Standards and Quality Certification Program
- G. National Electrical Manufacturers Association (NEMA):  
LD 3-05.....High-Pressure Decorative Laminates
- H. U.S. Department of Commerce, Product Standard (PS):  
PS20-05.....American Softwood Lumber Standard
- I. Federal Specifications (Fed. Spec.):  
A-A-1922A.....Shield Expansion  
A-A-1936.....Contact Adhesive  
FF-N-836D.....Nut, Square, Hexagon Cap, Slotted, Castle  
FF-S-111D(1).....Screw, Wood  
MM-L-736(C).....Lumber, Hardwood

## PART 2 - PRODUCTS

### 2.1 LUMBER

- A. Grading and Marking:
  - 1. Lumber shall bear the grade mark, stamp, or other identifying marks indicating grades of material.

2. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
3. The inspection agency for lumber shall be approved by the Board of Review, American Lumber Standards Committee, to grade species used.

B. Sizes:

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

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

1. Hardwood for transparent finish shall be premium grade, rotary cut white birch.

D. Softwood: PS-20, exposed to view appearance grades: Use Prime for painted or opaque finish.

## 2.2 PLYWOOD

A. Softwood Plywood:

1. Grading and Marking:
  - a. Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood.
  - b. The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PS1.
2. 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.
3. Plastic Laminate Plywood Cores:
  - a. Exterior Type, any species group.
  - b. Veneer Grade: A-C.

## 2.3 PARTICLEBOARD

A. NPA A208.1

B. Plastic Laminate Particleboard Cores:

1. Use Type 1, Grade 1-M-3, or Type 2, Grade 2-M-2, unless otherwise specified.
2. Use Type 2, Grade 2-M-2, exterior bond, for tops with sinks.

C. General Use: Type 1, Grade 1-M-3 or Type 2, Grade 2-M-2.

## **2.4 PLASTIC LAMINATE**

- A. NEMA LD-3.
- B. Exposed decorative surfaces including countertops, both sides of cabinet doors, and for items having plastic laminate finish: General Purpose, Type HGL.
- C. Cabinet Interiors including Shelving: Both of following options to comply with NEMA, CLS as a minimum.
  - 1. Plastic laminate clad plywood or particle board.
  - 2. Resin impregnated decorative paper thermally fused to particle board.
- D. Backing sheet on bottom of plastic laminate covered wood tops: Backer, Type HGP.

## **2.5 SOLID POLYMER MATERIAL**

- A. Solid polymer material for countertops as shown on the Drawings shall be 1/2-inch thick cast, non-porous, through-body acrylic boards meeting ANSI Z124.3 or Z124.6, Type 6. Superficial damage to a depth of 0.010 inch shall be repairable by sanding and/or polishing. Material shall comply with the following Class A (Class I) surface burning characteristics, as determined by testing identical products per UL 723 (ASTM E84): 1) Flame Spread Index: 25 or less; 2) Smoke Developed Index: 450 or less. Finish shall be matte. Color shall be as indicated in Section 09 06 00, SCHEDULE FOR FINISHES. Acceptable products are the following (or approved equal):
  - 1. Corian by E.I. DuPont de Nemours & Co., Inc.
  - 2. Solid Surfacing by Formica Corp.
  - 3. Avonite by Avonite Surfaces
  - 4. Staron
- B. Joint adhesive for solid polymer materials shall be manufacturer's standard two-part adhesive to create inconspicuous, non-porous joints by chemical bond.
- C. Factory fabricate components to the greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins. Form joints between components using manufacturer's standard joint adhesive, without conspicuous joints. Reinforce joints as required.
- D. Rout and finish component edges with clean, sharp returns. Rout cutouts, curves and contours to template. Provide smooth edges. Repair or replace defective or inaccurate work.

## **2.6 ADHESIVE**

- A. For Plastic Laminate: Fed. Spec. A-A-1936.
- B. For Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.

## 2.7 HARDWARE

### A. Rough Hardware:

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electric-galvanizing process.
2. Use galvanized coating on ferrous metal for exterior work, unless non-ferrous metals or stainless is used.
3. Fasteners:
  - a. Bolts with Nuts: FF-N-836.
  - b. Expansion Bolts: A-A-1922A.
  - c. Screws: Fed. Spec. FF-S-111.

### B. Finish Hardware

1. Cabinet Hardware: ANSI A156.9.
  - a. Door/Drawer Pulls: Wire pulls, 4" centers, satin stainless steel finish.
  - b. Drawer Slides: Blum Model BS230E.
  - c. File Drawer Slides: Blum Model BS430E full-extension.
  - d. File Follower Hanging File System: Knape & Vogt No. 476F ZC, extruded aluminum, clear finish.
  - e. Shelf Supports: 5mm steel pins.
  - f. Concealed Hinges: Blum Model 73T5590B, 120-degree, self-closing.
  - g. Cabinet Door Catch: Stanley SP41 or SP45. Use 1 per door, except use 2 per door over 48" high.
  - h. Cabinet Locks: Hafele Cylinder Module System, nickel-plated, keyed alike in each room and master-keyed.
  - i. Counter Support Bracket: A&M Hardware Supply (Mannheim, PA, 888-647-0200, [www.aandmhardware.com](http://www.aandmhardware.com)); size 18"D. x 24"H.
  - j. Wireway Grommet: Doug Mockett & Co. round plastic grommet; 2-1/2" diameter; color black.
  - k. Bumper Guards: Korogard B200 Bumper Guard with B201 Standard End Caps; color Maple Syrup.
  - l. Casters: 3" dia. black nylon caster with top plate mount, without brake. Hafele Cat. No. 660.57.321.

## 2.8 MOISTURE CONTENT

### A. Moisture content of lumber and millwork at time of delivery to site.

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

## 2.8 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 heartwood Redwood and Western Red Cedar, shall be preservative treated in accordance with AWPA Standards.
- B. Use Grade A, exterior plywood for treatment.

## 2.9 FABRICATION

- A. General:
  - 1. Except as otherwise specified, use AWI Premium Grade for architectural woodwork and interior millwork.
  - 2. Finish woodwork shall be free from pitch pockets.
  - 3. Except where special profiles are shown, trim shall be standard stock molding and members of the same species.
  - 4. Plywood shall be not less than 13 mm (1/2 inch), unless otherwise shown or specified.
  - 5. Edges of members in contact with concrete or masonry shall have a square corner caulking rebate.
  - 6. Fabricate members less than 4 m (14 feet) in length from one piece of lumber, back channeled and molded as shown.
  - 7. Interior trim and items of millwork to be painted may be fabricated from jointed, built-up, or laminated members, unless otherwise shown on drawings or specified.
- B. Plastic Laminate-Clad Casework:
  - 1. Factory glued to either a plywood or a particle board core, 3/4-inch thick, unless shown otherwise.
  - 2. Plastic laminate shall be used on all exposed surfaces including door fronts, drawer fronts, exposed shelves, and exposed cabinet body parts, except where shown otherwise.
  - 3. Prefinished particle board shall be used on all semi-exposed surfaces of the cabinet bodies, semi-exposed backs, and semi-exposed shelves, and shall be 3/4-inch thick, except at backs of cabinets it shall be 1/4-inch or 1/2-inch thick.
  - 4. PVC edge-banding shall be used on front face of semi-exposed shelves, semi-exposed cabinet body members, and at the edges of doors and drawer fronts. Exposed shelves and cabinet bodies shall be self-edged.
  - 5. All surfaces receiving plastic laminate shall receive a balancing sheet on the opposite side of the particleboard. If opposite surface is unexposed, use balancing backer sheet; if exposed, use plastic laminate as balancing material.



6. Where finished ends, doors, or drawer fronts are shown to be plastic laminate covered, the inner face shall be prefinished particleboard.
7. Where casework abuts walls or ceilings, provide a 3/4-inch scribe to match adjacent casework material. Hold face of scribe back 1 1/4-inches from the outer face of doors.
8. Drawer construction shall be of 1/2-inch thick hardwood construction, assembled with machine lock-shoulder corner joints with 1/4-inch thick fully let-in hardboard free floating bottom, except where required for file follower installation. Sealer shall be applied in two coats to all assembled drawer bodies prior to installation of hardware and drawer slides.
9. 3/4-inch thick material shall be used on all exposed and semi-exposed surfaces including doors, drawer fronts, shelves, aprons, and cabinet ends. Backs shall be 1/4-inch or 1/2-inch thick let into cabinet top. Provide 1x4 horizontal rails at the back as required for hanging.
10. Drill holes for shelf support pins into cabinet bodies at approximately 3" O.C. vertically.
11. All gaps between cabinet doors or drawers shall be approximately 1/16-inch.
12. The definition of "concealed", "semi-exposed", and "exposed" surfaces, as described above, shall be in accordance with the AWI Quality Standards, Guide Specifications and Quality Certification Program.
13. Shelves greater than 36 inches long (but less than 48 inches long) shall be 1-inch thick material.
14. Before proceeding with fabrication of casework required to be fitted to other construction, obtain field measurements, verify dimensions, and review equipment Shop Drawings (if necessary) to achieve accurate fit.
15. End fillers for use where upper cabinets or tall storage cabinets stop short of end walls shall be held back 1-1/4-inches from the outer face of cabinet doors. The openings shall be filled in flush with the tops of adjacent cabinets.
16. Corner fillers for use where tall storage cabinets and upper cabinets turn an inside corner shall be L-shaped with each leg of the "L" 2-inches wide (resulting in 3/4-inch cabinet offset, as these fillers shall be recessed from the front of the cabinet 1-1/4-inches). The tops of these openings shall be filled flush with the tops of adjacent cabinets at these blind inside corners.

C. Plastic Laminate-Clad Countertops:

1. Fabrication with plastic laminate over 38 mm (1-1/2 inch) thick core, unless shown otherwise. Core shall be two layers of 3/4-inch thick particleboard.
  - a. Use decorative laminate for exposed edges of tops 38 mm (1-1/2 inches) wide and on back splash and end splash.
  - b. Assemble back splash and end splash to counter top.
  - c. Use one piece counters for straight runs.
  - d. Miter corners for field joints with overlapping blocking on underside of joint.
  - e. Provide plastic backing sheet on underside of countertops, back-splashes, and end-splashes of countertops.
2. All countertops shall be fabricated long for scribing in the field.
3. Wall cleats supporting countertops at walls shall be 3/4-inch X 2-inch paint-grade hardwood. Recess back from face of countertop 4-inches.

### **PART 3 - EXECUTION**

#### **3.1 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain work areas and storage areas to a minimum temperature of 21°C (70°F) for not less than 10 days before and during installation of interior millwork.
- B. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

#### **3.2 INSTALLATION**

- A. General:
  1. Millwork receiving transparent finish shall be primed and back-painted on concealed surfaces. Set no millwork until primed and back-painted.
  2. Secure trim with fine finishing nails, screws, or glue as required.
  3. Set nails for putty stopping. Use washers under bolt heads where no other bearing plate occurs.
  4. Seal cut edges of preservative and treated wood materials with a certified acceptable sealer.
  5. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.
  6. Plumb and level items unless shown otherwise.
  7. Nail finish at each blocking, lookout, or other nailer and intermediate points; toggle or expansion bolt in place where nails are not suitable.

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**SECTION 07 21 13  
THERMAL INSULATION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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

**1.2 RELATED WORK**

Safing insulation: Section 07 84 00, FIRESTOPPING.

**1.3 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES .
- B. Manufacturer's Literature and Data:
  - 1. Insulation, each type used
  - 2. Adhesive, each type used
  - 3. Tape
- C. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

**1.4 STORAGE AND HANDLING:**

- A. Store insulation materials in weathertight enclosure.
- B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

**1.5 APPLICABLE PUBLICATIONS:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - C553-08.....Mineral Fiber Blanket Thermal Insulation for  
Commercial and Industrial Applications
  - E84-10.....Surface Burning Characteristics of Building  
Materials

**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
Rigid foam	9 percent recovered material
Foam-in-place	5 percent recovered material
Glass fiber reinforced	6 percent recovered material
Rock wool material	75 percent recovered material

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

## **2.2 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.

## **2.3 SPRAY FOAM INSULATION:**

- A. Spray foam insulation shall be a closed-cell polyurethane system utilizing an EPA-approved, zero ozone-depleting, blowing agent. The system shall be designed for use in commercial construction applications.
- B. Spray foam insulation shall be Spraytite 178 Series, as manufactured by BASF, or equal product by other manufacturers.

## **2.4 BLOWN-IN INSULATION:**

- A. Blown-in insulation for floor joist spaces shall be unbonded, virgin fiber loose fill fiberglass insulation designed for pneumatic applications. Insulation shall contain no chemicals to cause mildew or fungus growth; shall not contain asbestos; shall not rot or decay; shall contain no sustenance for insects or other pests; shall have water vapor absorption rate of 5% maximum by weight (per ASTM C1104); shall have a flame spread rating of 25 or less (per ASTM E84); and shall be rated noncombustible (per ASTM E136). Thickness shall be

full-height of the existing floor joist space. Acceptable products include the following (or approved equal):

1. ProPink Loose Fill Insulation; Owens-Corning
2. InsulSafe SP Fiber Glass Blowing Insulation; Certain Teed
3. Climate Pro Insulation; Johns-Manville
4. Jet Stream Blowing Insulation; Knauf Fiber Glass

#### **2.5 ADHESIVE:**

As recommended by the manufacturer of the insulation.

#### **2.6 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 batt or blanket insulation with tight joints and filling framing void completely. Seal cuts, tears, and unlapped joints with tape.
- C. Fit insulation tight against adjoining construction and penetrations, unless specified otherwise.

#### **3.2 ACOUSTICAL INSULATION:**

- A. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.
- B. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind outlets, around pipes, ducts, and services encased in wall or partition. Hold insulation in place with pressure sensitive tape or adhesive.
- C. Do not compress insulation below required thickness except where embedded items prevent required thickness.
- D. Where semirigid insulation is used which is not full thickness of cavity, adhere to one side of cavity maintaining continuity of insulation and covering penetrations or embedments in insulation.

#### **3.3 SPRAY FOAM INSULATION:**

- A. Install spray foam insulation where indicated on the Drawings per manufacturer's instructions.

- B. During installation of spray foam insulation, and for three (3) days minimum following, the construction area shall be vented and maintained at a negative pressure to prevent VOC's from entering occupied portions of the facility.

**3.4 BLOWN-IN INSULATION:**

- A. Install blown-in insulation where indicated on the Drawings per manufacturer's instructions.

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**SECTION 07 84 00  
FIRESTOPPING**

**PART 1 GENERAL**

**1.1 DESCRIPTION**

- A. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Closure of openings in walls against penetration of gases or smoke in smoke partitions.

**1.2 RELATED WORK**

- C. Sealants and application: Section 07 92 00, JOINT SEALANTS.
- D. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- C. List of FM, UL, or WH classification number of systems installed.
- D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

**1.4 DELIVERY AND STORAGE**

- A. Deliver materials in their original unopened containers with manufacturer's name and product identification.
- B. Store in a location providing protection from damage and exposure to the elements.

**1.5 WARRANTY**

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

**1.6 QUALITY ASSURANCE**

FM, UL, or WH or other approved laboratory tested products will be acceptable.

**1.7 APPLICABLE PUBLICATIONS**

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



E84-10.....Surface Burning Characteristics of Building  
Materials

E814-11.....Fire Tests of Through-Penetration Fire Stops

C. Factory Mutual Engineering and Research Corporation (FM):

Annual Issue Approval Guide Building Materials

D. Underwriters Laboratories, Inc. (UL):

Annual Issue Building Materials Directory

Annual Issue Fire Resistance Directory

1479-10.....Fire Tests of Through-Penetration Firestops

E. Warnock Hersey (WH):

Annual Issue Certification Listings

## **PART 2 - PRODUCTS**

### **2.1 FIRESTOP SYSTEMS**

- A. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stopping 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 the following properties:
  1. Contain no flammable or toxic solvents.
  2. Have no dangerous or flammable out-gassing during the drying or curing of products.
  3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
  4. When used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

- E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials shall have the following properties:
  - 1. Classified for use with the particular type of penetrating material used.
  - 2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
  - 3. Intumescent products which would expand to seal the opening and act as fire, smoke, toxic fumes, and, water sealant.
- F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84.
- G. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- H. Materials to be asbestos free.

## **2.2 SMOKE STOPPING IN SMOKE PARTITIONS**

- A. Use silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Use mineral fiber filler and bond breaker behind sealant.
- C. Sealants shall have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with E84.
- D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

Submit product data and installation instructions, as required by article, submittals, after an on site examination of areas to receive firestopping.

### **3.2 PREPARATION**

- A. Remove dirt, grease, oil, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.
- B. Remove insulation on insulated pipe for a distance of 150 mm (six inches) on either side of the fire rated assembly prior to applying the

firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.

### **3.3 INSTALLATION**

- A. Do not begin work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.
- B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.
- C. Install smoke stopping seals in smoke partitions.

### **3.4 CLEAN-UP AND ACCEPTANCE OF WORK**

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Do not move materials and equipment to the next-scheduled work area until completed work is inspected and accepted by the Resident Engineer.
- C. Clean up spills of liquid type materials.

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**SECTION 07 92 00  
JOINT SEALANTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

Section covers all sealant and caulking materials and their application, wherever required for complete installation of building materials or systems.

**1.2 RELATED WORK:**

- A. Firestopping penetrations: Section 07 84 00, FIRESTOPPING.
- B. Glazing: Section 08 80 00, GLAZING.
- C. Sound rated gypsum partitions/sound sealants: Section 09 29 00, GYPSUM BOARD.
- D. Mechanical Work: Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSION, Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

**1.3 QUALITY CONTROL:**

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:
  - 1. Locate test joints where indicated or, if not indicated, as directed by Contracting Officer.
  - 2. Conduct field tests for each application indicated below:
    - a. Each type of elastomeric sealant and joint substrate indicated.
    - b. Each type of non-elastomeric sealant and joint substrate indicated.
  - 3. Notify Resident Engineer seven days in advance of dates and times when test joints will be erected.
- D. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.

**1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.
- D. Manufacturer's Literature and Data:
  - 1. Caulking compound
  - 2. Primers
  - 3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

**1.5 PROJECT CONDITIONS:**

- A. Environmental Limitations:
  - 1. Do not proceed with installation of joint sealants under following conditions:
    - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 °C (40 °F).
    - b. When joint substrates are wet.
- B. Joint-Width Conditions:
  - 1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions:
  - 1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

**1.6 DELIVERY, HANDLING, AND STORAGE:**

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures exceeding 32° C (90° F) or less than 5° C (40° F).

**1.7 DEFINITIONS:**

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Back-up Rod: A type of sealant backing.

C. Bond Breakers: A type of sealant backing.

D. Filler: A sealant backing used behind a back-up rod.

#### **1.8 WARRANTY:**

A. Warranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be extended to two years.

B. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

#### **1.9 APPLICABLE PUBLICATIONS:**

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

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

C509-06.....Elastomeric Cellular Preformed Gasket and  
Sealing Material.

C612-10.....Mineral Fiber Block and Board Thermal  
Insulation.

C717-10.....Standard Terminology of Building Seals and  
Sealants.

C834-10.....Latex Sealants.

C919-08.....Use of Sealants in Acoustical Applications.

C920-10.....Elastomeric Joint Sealants.

C1021-08.....Laboratories Engaged in Testing of Building  
Sealants.

C1193-09.....Standard Guide for Use of Joint Sealants.

C1330-02 (R2007).....Cylindrical Sealant Backing for Use with Cold  
Liquid Applied Sealants.

D1056-07.....Specification for Flexible Cellular Materials—  
Sponge or Expanded Rubber.

E84-09.....Surface Burning Characteristics of Building  
Materials.

C. Sealant, Waterproofing and Restoration Institute (SWRI).  
The Professionals' Guide

**PART 2 - PRODUCTS****2.1 SEALANTS:**

- A. Building sealant (caulking) for all interior applications (except as noted below) shall be two-part polyurethane sealant and shall be one of the following or approved equal:
  - 1. Sonolastic NP-2; Sonneborn
  - 2. Dynatrol II; Pecora Corporation
  - 3. Dymeric 240; Tremco Manufacturing Co.
  - 4. Sikaflex-2C NSEZ Mix; Sika Corporation
- B. Sealant (caulking) for all exterior applications shall be one part silicone sealant and shall be the following, or equal products by Pecora, Sonneborn, Tremco, or approved equal:
  - 1. 795 Silicone Building Sealant; Dow Corning Corporation
- C. Acoustical sealant, for use at certain partitions (as shown on Drawings) shall be one-component, pure process butyl rubber base sealant, aluminum gray color, and shall be Acoustical Sealant BA-98 manufactured by Pecora Corporation, or approved equal.

**2.2 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 standard color to most closely match adjacent surfaces, 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 POURIOUS SURFACES:**

Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

# **PART 3 - EXECUTION**

## **3.1 INSPECTION:**

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

## **3.2 PREPARATIONS:**

- A. Prepare joints in accordance with manufacturer's instructions and SWRI.
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
  - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.



2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
  - a. Concrete.
  - b. Masonry.
  - c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
  - a. Metal.
  - b. Glass.
  - c. Porcelain enamel.
  - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
  1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
  1. Apply primer prior to installation of back-up rod or bond breaker tape.
  2. Use brush or other approved means that will reach all parts of joints.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

### **3.3 BACKING INSTALLATION:**

- A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
- D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.

E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.

F. Take all necessary steps to prevent three sided adhesion of sealants.

### **3.4 SEALANT DEPTHS AND GEOMETRY:**

A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.

B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

### **3.5 INSTALLATION:**

A. General:

1. Apply sealants and caulking only when ambient temperature is between 5° C and 38° C (40° and 100° F).
2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
5. Avoid dropping or smearing compound on adjacent surfaces.
6. Fill joints solidly with compound and finish compound smooth.
7. Tool joints to concave surface unless shown or specified otherwise.
8. Finish paving or floor joints flush unless joint is otherwise detailed.
9. Apply compounds with nozzle size to fit joint width.
10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.

B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.

C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.

1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.

2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions before taping and finishing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

### **3.6 FIELD QUALITY CONTROL:**

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as recommended by sealant manufacturer:
  1. Extent of Testing: Test completed elastomeric sealant joints as follows:
    - a. Perform 10 tests for first 300 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
- B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- 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. Apply building sealant at the following locations (see Part B - Products for sealant type):
  - 1. At all exposed isolation, expansion, and control joints (interior and exterior)
  - 2. At perimeter of exterior window and door frames (exterior and interior faces)
  - 3. At framed openings at interior walls where caulking is shown on the Drawings
  - 4. At vertical jambs of all new interior window and door frames
  - 5. At juncture between all countertops and non-integral back/side splashes
  - 6. At juncture between all lavatory countertop back/side splashes and walls
  - 7. At miscellaneous locations where caulking is shown on the Drawings
  - 8. At penetrations thru exterior walls for HVAC/electrical piping/conduits

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**SECTION 08 11 13  
HOLLOW METAL DOORS AND FRAMES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies steel frames and related components.
- B. Terms relating to steel frames as defined in ANSI A123.1 and as specified.

**1.2 RELATED WORK**

- A. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- B. Door Hardware: Section 08 71 00, DOOR HARDWARE.

**1.3 SUBMITTALS**

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

**1.4 SHIPMENT**

- A. Prior to shipment label each frame to show location, size, door swing and other pertinent information.
- B. Fasten temporary steel spreaders across the bottom of each door frame.

**1.5 STORAGE AND HANDLING**

- A. Store frames at the site under cover.
- B. Protect from rust and damage during storage and erection until completion.

**1.6 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. 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):  
A250.8-03 (R2008).....Standard Steel Doors and Frames
- D. American Society for Testing and Materials (ASTM):  
A568/568-M-11.....Steel, Sheet, Carbon, and High-Strength, Low-alloy, Hot-Rolled and Cold-Rolled  
A1008-10.....Steel, sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Anchors, Fastenings and Accessories: Fastenings anchors, clips connecting members and sleeves from zinc coated steel.
- B. Prime Paint: Paint that meets or exceeds the requirements of A250.8.

### **2.2 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. Knocked-down frames are not acceptable.
- B. Reinforcement and Covers:
  - 1. SDI A250.8 for, minimum thickness of steel reinforcement welded to back of frames.
  - 2. Provide mortar guards securely fastened to back of hardware reinforcements except on lead-lined frames.
- C. Terminated Stops: SDI A250.8.
- D. 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.
  - 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.
    - b. Form jamb anchors of not less than 1 mm (0.042 inch) thick steel unless otherwise specified.
    - c. 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.
    - d. Anchors for frames set in prepared openings:
      - 1) Steel pipe spacers with 6 mm (1/4 inch) inside diameter welded to plate reinforcing at jamb stops or hat shaped formed strap spacers, 50 mm (2 inches) wide, welded to jamb near stop.

- 2) Drill jamb stop and strap spacers for 6 mm (1/4 inch) flat head bolts to pass thru frame and spacers.
- 3) Two piece frames: Subframe or rough buck drilled for 6 mm (1/4 inch) bolts.
- e. Modify frame anchors to fit special frame and wall construction and provide special anchors where shown or required.

## **2.6 SHOP PAINTING**

SDI A250.8.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Plumb, align and brace frames securely until permanent anchors are set.
  - 1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
  - 2. Use wood spreaders at bottom of frame if the shipping spreader is removed.
  - 3. Protect frame from accidental abuse.
  - 4. Remove wood spreaders and braces only after the walls are built and jamb anchors are secured.
- B. Floor Anchors:
  - 1. Anchor the bottom of door frames to floor with two 6 mm (1/4 inch) diameter expansion bolts. Use 9 mm (3/8 inch) bolts on lead lined frames.
  - 2. Power actuated drive pins may be used to secure frame anchors to concrete floors.
- C. Jamb Anchors:
  - 1. Coat frame back with a bituminous coating prior to lining of grout filling in masonry walls.
  - 2. Secure anchors to sides of studs with two fasteners through anchor tabs. Use steel drill screws to steel studs.
  - 3. Frames set in prepared openings of masonry or concrete: Expansion bolt to wall with 6 mm (1/4 inch) expansion bolts through spacers. Where subframes or rough bucks are used, 6 mm (1/4 inch) expansion bolts on 600 mm (24 inch) centers or power activated drive pins 600 mm (24 inches) on centers. Secure two piece frames to subframe or rough buck with machine screws on both faces.

### 3.2 INSTALLATION OF DOORS AND APPLICATION OF HARDWARE

Install doors and hardware as specified in Sections Section 08 14 00,  
WOOD DOORS, and Section 08 71 00, DOOR HARDWARE.

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**SECTION 08 14 00  
INTERIOR WOOD DOORS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies interior flush doors with prefinish, prefit option.
- B. Section includes smoke doors.

**1.2 RELATED WORK**

- A. Metal door frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- B. Door hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- C. Installation of doors and hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 14 00, WOOD DOORS, or Section 08 71 00, DOOR HARDWARE.
- D. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- E. Finish: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
  - 1. Veneer sample 200 mm (8 inch) by 275 mm (11 inch) by 6 mm (1/4 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is accepted.
- C. Shop Drawings:
  - 1. Show every door in project and schedule location in building.
  - 2. Indicate type, grade, finish and size; include detail of glazing, sound gasketing, and pertinent details.
  - 3. Provide information concerning specific requirements not included in the manufacturer's literature and data submittal.
- D. Laboratory Test Reports:
  - 1. Screw holding capacity test report in accordance with WDMA T.M.10.
  - 2. Split resistance test report in accordance with WDMA T.M.5.
  - 3. Cycle/Slam test report in accordance with WDMA T.M.7.
  - 4. Hinge-Loading test report in accordance with WDMA T.M.8.

**1.4 WARRANTY**

A. Doors are subject to terms of Article titled "Warranty of Construction", FAR clause 52.246-21, except that warranty shall be as follows:

1. For interior doors, manufacturer's warranty for lifetime of original installation.

**1.5 DELIVERY AND STORAGE**

- A. Factory seal doors and accessories in minimum of 6 mill polyethylene bags or cardboard packages which shall remain unbroken during delivery and storage.
- B. Store in accordance with WDMA I.S.1-A, J-1 Job Site Information.
- C. Label package for door opening where used.

**1.6 APPLICABLE PUBLICATIONS**

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

- A. Window and Door Manufacturers Association (WDMA):
- I.S.1-A-04.....Architectural Wood Flush Doors
  - T.M.5-90.....Split Resistance Test Method
  - T.M.6-08.....Adhesive (Glue Bond) Durability Test Method
  - T.M.7-08.....Cycle-Slam Test Method
  - T.M.8-08.....Hinge Loading Test Method
  - T.M.10-08.....Screwholding Test Method
- B. National Fire Protection Association (NFPA):
- 80-07.....Protection of Buildings from Exterior Fire
  - 252-08.....Fire Tests of Door Assemblies

**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 birch.

- 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 except maple may be used for stile face veneer on birch doors.
- 4. Factory sand doors for finishing.
- C. Wood for stops, muntins and moldings of flush doors required to have transparent finish:
  - 1. Solid Wood of same species as face veneer, except maple may be used on birch doors.
  - 2. Glazing:
    - a. On non-labeled doors use applied wood stops nailed tight on room side and attached on opposite side with flathead, countersunk wood screws, spaced approximately 125 mm (5 inches) on centers.
- D. Smoke Barrier Doors:
  - 1. For glazed openings use steel frames approved for use in labeled doors.

### **2.3 PREFINISH, PREFIT OPTION**

- A. Flush doors may be factory machined to receive hardware, bevels, undercuts, cutouts, accessories and fitting for frame.
- B. Factory fitting to conform to specification for shop and field fitting, including factory application of sealer to edge and routings.
- C. Flush doors to receive transparent finish (in addition to being prefit) shall be factory finished as follows:
  - 1. WDMA I.S.1-A Section F-3 specification for System TR-4, Conversion Varnish or System TR-5, Catalyzed Vinyl.
  - 2. Use stain when required to produce the finish specified in Section 09 06 00 SCHEDULE FOR FINISHES.

### **2.4 IDENTIFICATION MARK:**

- A. On top edge of door.
- B. Either a stamp, brand or other indelible mark, giving manufacturer's name, door's trade name, construction of door, code date of manufacture and quality.
- C. Accompanied by either of the following additional requirements:
  - 1. An identification mark or a separate certification including name of inspection organization.
  - 2. Identification of standards for door, including glue type.
  - 3. Identification of veneer and quality certification.

**2.5 SEALING:**

Give top and bottom edge of doors two coats of catalyzed polyurethane or water resistant sealer before sealing in shipping containers.

**PART 3 - EXECUTION****3.1 DOOR PREPARATION**

- A. Field, shop or factory preparation: Do not violate the qualified testing and inspection agency label requirements for fire rated doors.
- B. Clearances between Doors and Frames and Floors:
  - 1. Maximum 3 mm (1/8 inch) clearance at the jambs, heads, and meeting stiles, and a 19 mm (3/4 inch) clearance at bottom, except as otherwise specified.
- 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 edges of the doors smooth to touch.

**3.2 INSTALLATION OF DOORS APPLICATION OF HARDWARE**

Install doors and hardware as specified in this Section.

**3.3 DOOR PROTECTION**

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

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

Section specifies access doors or panels.

**1.2 RELATED WORK:**

- A. Locations of access doors for duct work cleanouts: Section 23 37 00, AIR OUTLETS AND INLETS.

**1.3 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Access doors, each type, showing construction, location and installation details.
- C. Manufacturer's Literature and Data: Access doors, each type.

**1.4 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):  
A1008-10.....Steel Sheet, Cold-Rolled, Carbon, Structural,  
High Strength Low-Alloy
- C. American Welding Society (AWS):  
D1.3-08.....Structural Welding Code Sheet Steel
- D. National Fire Protection Association (NFPA):  
80-10.....Fire Doors and Windows
- E. The National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500 Series.....Metal Finishes Manual
- F. Underwriters Laboratories, Inc. (UL):  
Fire Resistance Directory

**PART 2 - PRODUCTS**

**2.1 FABRICATION, GENERAL**

- A. Fabricate components to be straight, square, flat and in same plane where required.
  - 1. Slightly round exposed edges and without burrs, snags and sharp edges.
  - 2. Exposed welds continuous and ground smooth.
  - 3. Weld in accordance with AWS D1.3.

- B. Number of locks and non-continuous hinges as required to maintain alignment of panel with frame. For fire rated doors, use hinges and locks as required by fire test.
- C. Provide anchors or make provisions in frame for anchoring to adjacent construction. Provide size, number and location of anchors on four sides to secure access door in opening. Provide anchors as required by fire test.

## **2.2 ACCESS DOORS, FIRE RATED:**

- A. Shall meet requirements for "B" label 1-1/2 hours with maximum temperature rise of 120 degree C (250 degrees F).
- B. Comply with NFPA 80 and have Underwriters Laboratories Inc., or other nationally recognized laboratory label for Class B opening.
- C. Door Panel: Form of 0.9 mm (0.0359 inch) thick steel sheet, insulated sandwich type construction.
- D. Frame: Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed. Provide frame flange at perimeter where installed in concrete masonry or gypsum board openings.
  - 1. Weld exposed joints in flange and grind smooth.
  - 2. Provide frame flange at perimeter where installed in concrete masonry or gypsum board.
- E. Automatic Closing Device: Provide automatic closing device for door.
- F. Hinge: Continuous steel hinge with stainless steel pin.
- G. Lock:
  - 1. Self-latching, with provision for fitting flush a standard screw-in type lock cylinder.

## **2.3 ACCESS DOORS, FLUSH PANEL:**

- A. Door Panel:
  - 1. Form of 1.9 mm (0.0747 inch) thick steel sheet.
  - 2. Reinforce to maintain flat surface.
- B. Frame:
  - 1. Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed.
  - 2. Provide surface mounted units having frame flange at perimeter where installed in concrete, masonry, or gypsum board construction.
  - 3. Weld exposed joints in flange and grind smooth.
- C. Hinge:

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

D. Lock:

1. Flush, screwdriver operated cam lock.

**2.5 FINISH:**

- A. Provide in accordance with NAAMM AMP 500 series on exposed surfaces.
- B. Steel Surfaces: Baked-on prime coat over a protective phosphate coating.

**2.6 SIZE:**

- A. Minimum 450 mm (18 inches) square door unless otherwise shown.

**PART 3 - EXECUTION**

**3.1 LOCATION:**

- A. Provide access doors wherever any valves, traps, dampers, cleanouts, and other control items of mechanical, electrical and conveyor work are concealed in wall or partition, or are above ceiling of gypsum board or plaster.
- B. Use fire rated doors in fire rated partitions and ceilings.
- C. Use flush panels in partitions and gypsum board or plaster ceilings.

**3.2 INSTALLATION, GENERAL:**

- A. Install access doors in openings to have sides vertical in wall installations, and parallel to ceiling suspension grid or side walls when installed in ceiling.
- B. Set frames with flanges to overlap opening and so that face will be uniformly spaced from the finish surface.

**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; to maintain alignment; and to resist displacement during normal use of access door.
- C. Anchors for fire rated access doors shall meet requirements of applicable fire test.

**3.4 ADJUSTMENT:**

- A. Adjust hardware so that door panel will open freely.
- B. Adjust door when closed so door panel is centered in the frame.

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**SECTION 08 41 13**  
**ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies aluminum entrance work, including storefront construction; interior sliding doors; interior and exterior windows; and other components to make a complete assembly.

**1.2 RELATED WORK**

- A. Glass and Glazing: Section 08 80 00, GLAZING.
- B. Hardware: Section 08 71 00, DOOR HARDWARE.
- C. Texture and color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Electrical for Sliding Door Units: 120 VAC, 50/60 cycle, single phase, dedicated 20 amp circuit required.

**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. 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 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 that manufacturer regularly and presently manufactures aluminum entrances and storefronts as one of their principal products.
- C. Sliding door unit installer shall be factory trained, certified by AAADM, and experienced to perform work of this Section.



**1.5 DELIVERY, STORAGE AND HANDLING**

- A. Deliver aluminum entrance and storefront material to the site in packages or containers; labeled for identification with the manufacturer's name, brand and contents.
- B. Store aluminum entrance and storefront material in weather-tight and dry storage facility.
- C. Protect from damage from handling, weather and construction operations before, during and after installation.

**1.6 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - B209-07.....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 Welding Society (AWS):
  - D1.2-08.....Structural Welding Code Aluminum
- E. American Association of Automatic Door Manufacturers (AAADM)

**1.7 PERFORMANCE REQUIREMENTS**

- A. Shapes and thickness of framing members shall be sufficient to withstand a design wind load of not less than 25 psf inward and 25 psf outward, tested per ASTM E330, 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 0.38 kPa (8 pounds per square foot) of fixed area.

## **PART 2 - PRODUCTS**

### **2.1 BASIS OF DESIGN**

- A. The basis of design for storefront framing is Kawneer TriFab 451/451T framing system with center glazing, or approved equal.
- B. The basis of design for interior sliding door units is Horton Automatics Profiler 2000B Elite Belt Drive System, or approved equal.

### **2.2 MATERIALS**

- A. Aluminum, ASTM B209 and B221:
  - 1. Alloy 6063 temper T5 for doors, door frames, fixed glass sidelights, and storefronts.
  - 2. Alloy 6061 temper T6 for guide tracks for sliding doors and other extruded structural members.
- B. Thermal Break: Manufacturer standard low conductive material retarding heat flow in the framework, where insulating glass is scheduled.
- C. Fasteners:
  - 1. Aluminum: ASTM F468, Alloy 2024.
  - 2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.

### **2.3 FABRICATION**

- A. Fabricate doors of extruded aluminum sections not less than 3 mm (0.125 inch) thick. Fabricate glazing beads of aluminum not less than 1.0 mm (0.050 inch) thick.
- B. Accurately form metal parts and accurately fit and rigidly assemble joints, except those joints designed to accommodate movement. Seal joints to prevent leakage of both air and water.
- C. Make welds in aluminum in accordance with the recommended practice AWA D1.2. Use electrodes and methods recommended by the manufacturers of the metals and alloys being welded. Make welds behind finished surfaces

so as to cause no distortion or discoloration of the exposed side. Clean welded joints of welding flux and dress exposed and contact surfaces.

- D. Make provisions in doors and frames to receive the specified hardware and accessories. Coordinate schedule and template for hardware specified under Section 08 71 00, DOOR HARDWARE. Where concealed closers or other mechanisms are required, provide the necessary space, cutouts, and reinforcement for secure fastening.
- E. Fit and assemble the work at the manufacturer's plant. Mark work that cannot be permanently plant-assembled to assure proper assembly in the field.

#### **2.4 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.

#### **2.5 FRAMES**

- A. Fabricate frames for fixed glass and similar members from extruded aluminum not less than 3 mm (0.125 inch) thick.
- B. Provide integral stops and glass rebates and applied snap-on type trim.
- C. Use concealed screws, bolts and other fasteners. Secure cover boxes to frames in back of all lock strike cutouts.
- D. Fabricate framework with thermal breaks in frames where insulating glass is scheduled and specified under Section 08 80 00, GLAZING.

#### **2.6 INTERIOR SLIDING DOOR UNITS**

- A. MANUFACTURED DOOR UNITS: Shall include operator, header with roller track, carrier assemblies, framing jambs, sliding door panel, sidelite, activation, safety devices, and accessories required for complete installation.
  1. Configuration: Single Slide.
  2. Mounting Type: Perimeter mounted within rough opening with sliding panel sliding along sidelite.
  3. Door Type: Type 110; Slide-swing panel 'SX' shall slide along exterior side.

- B. OPERATOR: The Electric Operating Mechanism shall be Profiler® Series 2000B Elite Belt Drive. Maximum current draw shall not exceed 3.15 amps. The operator shall be mounted and concealed within the header.
1. Operating force shall be accomplished through a 1/8 HP DC permanent magnet motor with worm gear transmission and 1800 RPM working with drive belt, attached door hangers, and idler pulley. Drive belt to be steel reinforced nylon, 1/2" (13 mm) wide. Idler pulley to be reinforced, metallic material.
  2. Master Control shall be 16 bit microprocessor controller with dual on-board seven-segment alphanumeric diagnostic display and position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position and speed. The control shall have minimum of 28 programmable parameters including the following functions as required by ANSI A156.10:
    - a. Adjustable opening and closing speeds.
    - b. Adjustable back-check and latching.
    - c. Adjustable braking.
    - d. Adjustable hold-open time between 1 to 30 seconds.
    - e. Adjustable Reversing Circuit will reopen door unit if closing path is obstructed.
    - f. Separate day and night modes of operation with security override.
  3. Finger Safety: When unit slides open, strike rail of sliding panel will stop short of adjacent sidelite; resulting opening is net slide.
  4. On/Off Switch shall be supplied. When switched OFF, unit reverts to free manual operation (likewise during electrical power failure).
- C. PROFILER® HEADER: Shall be 4" (102mm) deep by 6" (152mm) high aluminum construction with extruded z-profile reinforcement for dead load and lateral strength. Header shall have removable face plate for service and adjustment of operator and controls. Header mounts flush to 4" framing jambs.
- D. CARRIER ASSEMBLIES AND HEADER ROLLER TRACK: Carrier assemblies shall support door panels with minimum four rollers per panel. Rollers will be steel, high quality ball bearing wheels 1-1/4" (32 mm) diameter. Anti-Derailing shall be accomplished by means of a continuous aluminum extrusion full length of slide panel travel. Overhead header roller track shall be continuous aluminum, nylon covered, and replaceable.

- F. SLIDING PANEL AND SIDELITE: Shall be aluminum, 1-3/4" (44 mm) deep with narrow stile rails. An intermediate, horizontal rail (muntin bar), 2 1/4" (57 mm) wide, shall be furnished for safety and division of glass . Optional bottom rail shall be 10" (254mm) tall. Sliding panels shall have concealed bottom guides to stabilize slide travel.
1. Weather-stripping to be along perimeter of sliding panel and swing-out sidelite. Weatherstripping material captured in extruded aluminum door panel. Surface applied self-adhesive weatherstripping not acceptable. Adjustable spring-loaded double astragal weather-stripping at lead edge, double mohair at interlock rails
  2. Standard glazing prep to be for 1/4" (6 mm) glass.
- G. BREAKOUT PANEL: Slide-swing panel can swing out 90° from any position of slide movement and require no more than 50 lbf. (222 N) of force applied at the lock stile to open. Slide-swing panel shall utilize spring loaded ball detent.
1. Slide-swing panel shall have torsion spring designed to re-close panel if pushed open in the direction of egress.
  2. Breakout mechanism shall provide support across full width of the door, in normal operating mode. In breakout mode, torsion assembly shall support weight of the door to minimize drop during emergency egress.
  3. Slide-swing panel shall include intermediate horizontal rail.
  4. Units with breakout feature are UL listed as an exit away and are compliant with NFPA 101.
- H. JAMBS/FRAME: Shall be aluminum. Jamb dimensions to be 1 3/4" (44mm) deep by 4" (102mm) wide.
- I. THRESHOLD: Shall be aluminum, 1/2" (25 mm) tall by 4" (102 mm) wide.
- J. HARDWARE: ANSI A156.5, Grade 1, 2-Point Locking provided and installed in strike rail shall include:
1. Hookbolt Latch, 5/8" laminated stainless steel, latching into jamb or adjacent strike rail.
  2. 3/8" hex-bolt into breakout carrier frame.
  3. Thumbturn mounted on interior side.
  4. Provide recore cylinder specified under Section 08 71 00, DOOR HARDWARE.

## 2.7 RELATED EQUIPMENT

- A. BASIC SENSOR SYSTEM: Shall be 24 VDC, class 11 circuit and shall be adjusted and installed in compliance with ANSI A156.10. System shall include the following:
  - 1. ACTIVATION SWITCHES:
    - a. Round metal push plates shall be mounted each side of door unit for activation of door.
    - b. A push button shall be mounted at the adjacent reception desk for activation of door.
  - 2. THRESHOLD PRESENCE SENSORS:
    - a. Header mounted sensors shall provide active infrared presence detection on each side of the door unit and shall remain active throughout the entire door opening and closing cycle.
    - b. Hold-open beams: Two pulsed infrared photoelectric beams to be mounted in vertical rails of sidelite or in jambs. Sender/receiver arrangement parallels door opening.

## 2.8 FINISH

- A. In accordance with NAAMM AMP 500 series.
- B. Anodized Aluminum:
  - 1. Clear Finish: Chemically etched medium matte, with clear anodic coating, Class I Architectural, 7 mils thick.
- C. Fluorocarbon Finish for Exterior Windows: AAMA 605.2, high performance coating.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Allowable Installation Tolerances: Install work plumb and true, in alignment and in relation to lines and grades shown. Variation of 3 mm (1/8 inch) in 2400 mm (eight feet), non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.
- B. Anchor aluminum frames to adjoining construction at heads, jambs and bottom and to steel supports, and bracing. Anchor frames with stainless steel or aluminum countersunk flathead, expansion bolts or machine screws, as applicable. Use aluminum clips for internal connections of adjoining frame sections.
- C. Install hardware specified under Section 08 71 00, DOOR HARDWARE.
- D. Contractor shall install all wiring to operator on a separate circuit breaker routed into header. Contractor shall install all necessary

power and low voltage wiring for proper operation of associated security systems.

### **3.2 ADJUSTING**

After installation of entrance and storefront work is completed, adjust and lubricate operating mechanisms to insure proper performance.

### **3.3 PROTECTION, CLEANING AND REPAIRING**

Remove all mastic smears and other unsightly marks, and repair any damaged or disfiguration of the work. Protect the installed work against damage or abuse.

- - - E N D - - -

**SECTION 08 71 00  
DOOR HARDWARE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Door hardware and related items necessary for complete installation and operation of doors.

**1.2 RELATED WORK**

- A. Caulking: Section 07 92 00 JOINT SEALANTS.
- B. Application of Hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES; Section 08 14 00, WOOD DOORS; and Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- C. Electrical: Division 26, ELECTRICAL.
- D. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

**1.3 GENERAL**

- A. All hardware shall comply with UFAS (Uniform Federal Accessible Standards), unless specified otherwise.
- B. Provide rated door hardware assemblies where required by most current version of the International Building Code (IBC).
- C. Hardware for Labeled Fire Doors and Exit Doors: Conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, larger sizes, or better grades are specified herein under paragraph HARDWARE SETS. In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements.
- D. Hardware for application on metal and wood doors and frames shall be made to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.
- E. The following items shall be of the same manufacturer, except as otherwise specified:
  - 1. Locksets.
  - 2. Hinges for hollow metal and wood doors.
  - 3. Surface applied overhead door closers.
  - 4. Exit devices.
  - 5. Floor closers.



**1.4 WARRANTY**

A. Door hardware shall be subject to the terms of FAR Clause 52.246-21, except that the Warranty period shall be two years in lieu of one year for all items except, as noted below:

1. Locks, latchsets, and panic hardware: 5 years.
2. Door closers and continuous hinges: 10 years.

**1.5 MAINTENANCE MANUALS**

A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article titled INSTRUCTIONS, furnish maintenance manuals and instructions on all door hardware. Provide installation instructions with the submittal documentation.

**1.6 SUBMITTALS**

A. Submittals shall be in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23. Submit 2 final copies of the final approved schedules to VAMC Locksmith as record copies.

B. Hardware Schedule: Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr. Name and Catalog No.	Key Control Symbols	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designation

C. Samples and Manufacturers' Literature:

1. Samples: All hardware items proposed for the project that have not been previously approved by Builders Hardware Manufacturers Association shall be submitted for approval. Tag and mark all items with manufacturer's name, catalog number and project number.
2. Samples are not required for hardware listed in the specifications by manufacturer's catalog number, if the contractor proposes to use the manufacturer's product specified.

D. Certificate of Compliance and Test Reports: Submit certificates that hardware conforms to the requirements specified herein. Certificates shall be accompanied by copies of reports as referenced. The testing shall have been conducted either in the manufacturer's plant and

certified by an independent testing laboratory or conducted in an independent laboratory, within four years of submittal of reports for approval.

#### **1.7 DELIVERY AND MARKING**

- A. Deliver items of hardware to job site in their original containers, complete with necessary appurtenances including screws, keys, and instructions. Tag one of each different item of hardware and deliver to Resident Engineer for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in Resident Engineer's office until all other similar items have been installed in project, at which time the Resident Engineer will deliver items on file to Contractor for installation in predetermined locations on the project.

#### **1.8 PREINSTALLATION MEETING**

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

#### **1.9 INSTRUCTIONS**

- A. Keying: All cylinders shall be keyed into existing Grand Master Key System. Provide removable core cylinders that are removable only with a special key or tool without disassembly of knob or lockset. Cylinders shall be 7-pin type. Keying information shall be furnished at a later date by the Resident Engineer.

#### **1.10 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the

basic designation only. In text, hardware items are referred to by series, types, etc., listed in such specifications and standards, except as otherwise specified.

B. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):

A156.1-06.....Butts and Hinges

A156.2-03.....Bored and Pre-assembled Locks and Latches

A156.3-08.....Exit Devices, Coordinators, and Auto Flush  
Bolts

A156.4-08.....Door Controls (Closers)

A156.5-01.....Auxiliary Locks and Associated Products

A156.6-05.....Architectural Door Trim

A156.8-05.....Door Controls - Overhead Stops and Holders

A156.14-07 .....Sliding and Folding Door Hardware

A156.16-08.....Auxiliary Hardware

A156.17-04 .....Self-Closing Hinges and Pivots

A156.18-06.....Materials and Finishes

A156.22-05.....Door Gasketing and Edge Seal Systems

A156.25-07 .....Electrified Locking Devices

A156.26-06.....Continuous Hinges

A156.28-07 .....Master Keying Systems

A156.29-07 .....Exit Locks and Alarms

A250.8-03.....Standard Steel Doors and Frames

C. National Fire Protection Association (NFPA):

80-10.....Fire Doors and Fire Windows

101-09.....Life Safety Code

D. Underwriters Laboratories, Inc. (UL):

Building Materials Directory (2008)

**PART 2 - PRODUCTS**

## 2.1 BUTT HINGES

A. ANSI A156.1. Provide only three-knuckle hinges, except five-knuckle where the required hinge type is not available in a three-knuckle version (e.g., some types of swing-clear hinges). The following types of butt hinges shall be used for the types of doors listed, except where otherwise specified:

1. Interior Doors: Type A8112/A5112 for doors 900 mm (3 feet) wide or less and Type A8111/A5111 for doors over 900 mm (3 feet) wide.

## 2.2 DOOR CLOSING DEVICES

A. Closing devices shall be products of one manufacturer.

## 2.3 OVERHEAD CLOSERS

A. Conform to ANSI A156.4, Grade 1.

B. Closers shall conform to the following:

1. The closer shall have minimum 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back-check effective between 60 degrees and 85 degrees of door opening.
2. Where specified, closer shall have hold-open feature.
3. Size Requirements: Provide multi-size closers, sizes 1 through 6, except where multi-size closer is not available for the required application.
4. Material of closer body shall be forged or cast.
5. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.
6. Closers shall have full size metal cover; plastic covers will not be accepted.
7. Closers shall have adjustable hydraulic back-check, separate valves for closing and latching speed, adjustable back-check positioning valve, and adjustable delayed action valve.
9. Provide closers with any accessories required for the mounting application, including (but not limited to) drop plates; special soffit plates; spacers for heavy-duty parallel arm fifth screws; bull-nose or other regular arm brackets; longer or shorter arm assemblies; and special factory templating. Provide special arms, drop plates, and templating as needed to allow mounting at doors with overhead stops and/or holders.
10. Closer arms or back-check valve shall not be used to stop the door from overswing, except in applications where a separate wall, floor, or overhead stop cannot be used.
11. Provide parallel arm closers with heavy duty rigid arm.
12. Where closers are to be installed on the push side of the door, provide parallel arm type except where conditions require use of top jamb arm.
13. Provide all surface closers with the same body attachment screw pattern for ease of replacement and maintenance.
14. All closers shall have a 1-1/2-inch (38mm) minimum piston diameter.

## 2.4 DOOR STOPS

- A. Conform to ANSI A156.16.
- B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For concrete, masonry or quarry tile construction, use lead expansion shields for mounting door stops.
- C. Where cylindrical locks with turn pieces or pushbuttons occur, equip wall bumpers Type L02251 (rubber pads having concave face) to receive turn piece or button.
- D. Where the specified wall or floor stop cannot be used, provide concealed overhead stops (surface-mounted where concealed cannot be used).

## 2.5 OVERHEAD DOOR STOPS AND HOLDERS

- A. Conform to ANSI Standard A156.8. Overhead holders shall be of sizes recommended by holder manufacturer for each width of door. Set overhead holders for 110 degree opening, unless limited by building construction or equipment. Provide Grade 1 overhead concealed slide type: stop-only at rated doors and security doors; hold-open type with exposed hold-open on/off control at all other doors requiring overhead door stops.

## 2.6 LOCKS AND LATCHES

- A. Conform to ANSI A156.2. Locks and latches for doors 45 mm (1-3/4 inch) thick or over shall have beveled fronts. Lock cylinders shall have not less than 7- pins. Cylinders for all locksets shall be removable core type. Cylinder shall be removable by special key or tool. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the Grand Master Key System. Disassembly of lever or lockset shall not be required to remove core from lockset. Provide temporary keying device or construction core to allow opening and closing during construction and prior to the installation of final cores.
- B. In addition to above requirements, locks and latches shall comply with following requirements:
  - 1. Cylindrical Locksets and Latchsets: Levers shall meet ADA (Americans with Disabilities Act) requirements. Cylindrical locksets shall be series 4000 Grade I. All locksets and latchsets shall be furnished with 122.55 mm (4-7/8 inch) curved lip strike and wrought box. At outswing pairs with overlapping astragals, provide flat lip strike

with 21mm (7/8 inch) lip-to-center dimension. Provide lever design indicated.

2. Auxiliary locks shall be as specified under hardware sets and conform to ANSI A156.5.

## 2.7 KEYS

- A. Stamp all keys with change number and key set symbol. Furnish keys in quantities as follows:

Locks/Keys	Quantity
Cylinder locks	2 keys each
Cylinder lock change key blanks	100 each different key way
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys
Control key	2 keys

## 2.8 KICK PLATES AND MOP PLATES

- A. Conform to ANSI Standard A156.6.
- B. Provide protective plates as specified below:
  1. Kick plates, mop plates and armor plates of metal, Type J100 series.
  2. Provide kick plates and mop plates where specified. Kick plates shall be 305 mm (12 inches) high. Mop plates shall be 152 mm (6 inches) high. Both kick and mop plates shall be minimum 1.27 mm (0.050 inches) thick. Provide kick and mop plates beveled on all 4 edges (B4E). On push side of doors where jamb stop extends to floor, make kick plates 38 mm (1-1/2 inches) less than width of door, except pairs of metal doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other kick and mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick and mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.
  3. Kick plates and/or mop plates are not required on following door sides:
    - a. Exterior side of exterior doors;
    - b. Both sides of aluminum entrance doors.

## 2.9 EXIT DEVICES

- A. Conform to ANSI Standard A156.3. Exit devices shall be Grade 1; type and function are specified in hardware sets. Trim shall have cast satin

stainless steel lever handles of design similar to locksets, unless otherwise specified. Provide key cylinders for keyed operating trim and, where specified, cylinder dogging.

- B. At non-rated openings with panic hardware, provide panic hardware with key cylinder dogging feature.
- C. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

## **2.10 MISCELLANEOUS HARDWARE**

- A. Mutes: Conform to ANSI A156.16. Provide door mutes or door silencers Type L03011 or L03021, depending on frame material, of light gray color, on each steel or wood door frame, except at fire-rated frames. Furnish 3 mutes for single doors and 2 mutes for each pair of doors, except double-acting doors. Provide 2 mutes for each edge of sliding door which would contact door frame.

## **2.11 FINISHES**

- A. Exposed surfaces of hardware shall have ANSI A156.18, finishes as specified below. Finishes on all hinges, pivots, closers, thresholds, etc., shall be as specified below under "Miscellaneous Finishes."
- B. 626 or 630: All surfaces on exterior and interior of buildings, except where other finishes are specified.
- C. Miscellaneous Finishes:
  - 1. Hinges, exterior doors: 626.
  - 2. Hinges, interior doors: 626.
  - 4. Door Closers: Factory applied paint finish; Dull or Satin Aluminum color; 689.
  - 5. Thresholds: Mill finish aluminum.

## **2.12 BASE METALS**

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

<b>Finish</b>	<b>Base Metal</b>
652	Steel
626	Brass or bronze
630	Stainless steel

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

A. For new buildings locate hardware on doors at heights specified below, with all hand-operated hardware centered within 864 mm (34 inches) to 1200 mm (48 inches), unless otherwise noted:

1. Hardware Heights from Finished Floor:

- a. Exit devices centerline of strike (where applicable) 1024 mm (40-5/16 inches).
- b. Locksets and latch sets centerline of strike 1024 mm (40-5/16 inches).
- c. Deadlocks centerline of strike 1219 mm (48 inches).
- d. Centerline of door pulls to be 1016 mm (40 inches).
- e. Push plates and push-pull shall be 1270 mm (50 inches) to top of plate.
- f. Push-pull latch to be 1024 mm (40-5/16 inches) to centerline of strike.
- g. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.

**3.2 INSTALLATION**

- A. Closer devices, including those with hold-open features, shall be equipped and mounted to provide maximum door opening permitted by building construction or equipment. Closers shall be mounted on side of door inside rooms, inside stairs, and away from corridors. At exterior doors, closers shall be mounted on interior side. Where closers are mounted on doors they shall be mounted with sex nuts and bolts; foot shall be fastened to frame with machine screws.
- B. Hinge leaves shall be sufficiently wide to allow doors to swing clear of door frame trim and surrounding conditions.
- C. Fastenings: Suitable size and type, and shall harmonize with hardware as to material and finish. Provide machine screws and lead expansion shields to secure hardware to concrete, ceramic or quarry floor tile, or solid masonry. Fiber or rawl plugs and adhesives are not permitted. All fastenings exposed to weather shall be of nonferrous metal.
- D. After locks have been installed, show Resident Engineer that keys operate their respective locks in accordance with keying requirements. All keys Master Key level and above shall be sent Registered Mail to the Medical Center Director along with the bitting list. Also a copy of



the invoice shall be sent to the Resident Engineer for his records. Installation of locks which do not meet specified keying requirements shall be considered sufficient justification for rejection and replacement of all locks installed on project.

### 3.3 FINAL INSPECTION

- A. Installer to provide letter to Resident Engineer that upon completion, installer has visited the Project and has accomplished the following:
1. Re-adjusted hardware.
  2. Evaluated maintenance procedures and recommended changes or additions, and instructed VA personnel.
  3. Identified items that have deteriorated or failed.
  4. Submitted written report identifying problems.

### 3.4 DEMONSTRATION

- A. Demonstrate efficacy of mechanical and electrical hardware, and electronic hardware systems, including adjustment and maintenance procedures, to satisfaction of Resident Engineer and VA Locksmith.

### 3.5 HARDWARE MANUFACTURERS

Manufacturers and models designated in this Section are intended to define the exact standards of quality, function and design required:

<u>ITEM</u>	<u>SPECIFIED</u>	<u>ACCEPTABLE</u>
<u>Hinges</u>	Stanley	Hager, McKinney, or equal
<u>Locks</u>	Best	Other acceptable manufacturers shall be fully compatible with existing Medical Center Best Locks.
<u>Closers</u>	Norton	LCN, Stanley, or equal
<u>Exit Devices</u>	Precision	Von Duprin, or equal
<u>Power Transfers</u>	Precision	Von Duprin, or equal
<u>Power Supplies</u>	Precision	Von Duprin, or equal
<u>Overhead Stops</u>	Rixson	ABH, Glynn Johnson, or equal
<u>Box Rail Sliding Hardware</u>	Real Carriage	Door Company, or equal
<u>Weatherproofing,</u>	Pemko	Reese, or equal
<u>Gasketing</u>		
<u>Flat Goods,</u>	Rockwood	Trimco, Ives, or equal
<u>Door Bolts, Push Plates, Pull Plates, Kick Plates, Mop Plates,</u>		
<u>Wall Stops</u>		

**3.6 HARDWARE SETS**

- A. Following sets of hardware correspond to hardware sets shown on Drawings. Only those hardware sets that are shown on drawings will be required.
- B. Hardware Consultant working on the project will be responsible for providing additional information regarding these hardware sets. The numbers shown in the following sets come from BHMA standards.

**HARDWARE SET NO. 1**

1-1/2 Pairs	Hinges	CB1900R	4-1/2" x 4-1/2"	US26D
1 Each	Passage Set	93K-0-N-15D-S3		626
1 Each	Wall Stop	#403		US26D

**HARDWARE SET NO. 2**

1-1/2 Pairs	Hinges	CB1901R	5" x 4-1/2"	US26D
1 Each	Passage Set	93K-0-N-15D-S3		626
1 Each	Kick Plate			US32D
1 Each	Wall Stop	#403		US26D

**HARDWARE SET NO. 3**

1/2 Pair	Hinges	CB1900R	4-1/2" x 4-1/2"	US26D
1 Pair	Spring Hinges	2060R		US26D
1 Each	Privacy Set	93K-0-L-15D-S3		626
1 Each	Kick Plate			US32D
1 Each	Wall Stop	#403		US26D

**HARDWARE SET NO. 4**

1-1/2 Pairs	Hinges	CB1900R	4-1/2" x 4-1/2"	US26D
1 Each	Lockset	93K-7-AB-15D-S3		626
1 Each	Wall Stop	#403		US26D

**HARDWARE SET NO. 5**

1-1/2 Pairs	Hinges	CB1900R	4-1/2" x 4-1/2"	US26D
1 Each	Lockset	93K-7-R-15D-S3		626
1 Each	Closer	7500		689
1 Each	Kick Plate			US32D
1 Each	Wall Stop	#403		US26D
1 Set	Gasketing	S88D		

**HARDWARE SET NO. 6**

1-1/2 Pairs	Hinges	CB1901R	5" x 4-1/2"	US26D
1 Each	Exit Device	ELR2103 x 4903A		US32D
1 Each	Power Transfer	EPT-5		
1 Each	Power Supply	ELR151		
1 Each	Recore Cylinder			626
1 Each	Closer	CPS7500		689
1 Each	Kick Plate			US32D

- Card Reader to be provided and installed by others.

**HARDWARE SET NO. 7**

- 1 Each Stainless Steel Box Rail Kit
- 1 Each Pocket Door Pull #890 US26D
- Specified Box Rail Kit contains all hardware required for a complete and functioning sliding barn door.

**HARDWARE SET NO. 8**

- 2 Each Recore Cylinders 626
- Balance of hardware by aluminum door and frame supplier.

- - - END - - -

**SECTION 08 80 00  
GLAZING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies glass, film, plastic glazing, and 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. Framed Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.

**1.3 LABELS**

A. Temporary labels:

1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness.
2. Label in accordance with NFRC (National Fenestration Rating Council) label requirements.
3. Temporary labels shall remain intact until glass is approved by Resident Engineer.

B. Permanent labels:

1. Locate in corner for each pane.
2. Label in accordance with ANSI Z97.1 and SGCC (Safety Glass Certification Council) label requirements.
  - a. Tempered glass.
  - b. Laminated glass; or have certificate for panes without permanent label.
  - c. Organic coated glass.

**1.4 PERFORMANCE REQUIREMENTS**

A. Building Enclosure Vapor Retarder and Air Barrier:

1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

B. Glass Thickness:

1. Select thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.
2. Test in accordance with ASTM E 1300.

3. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

C. Laminated glass:

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 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.

### 1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Certificates:
  1. Certificates stating that wire glass meets requirements for safety glazing material as specified in ANSI Z97.1.
  2. Certificate on shading coefficient.
  3. Certificate on "R" value when value is specified.
- C. Warranty: Submit written guaranty, conforming to General Condition requirements, and to "Warranty of Construction" Article in this Section.
- D. Manufacturer's Literature and Data:
  1. Glass, each kind required.
  2. Plastic glazing.
  3. Insulating glass units.
  4. Laminated glass.
  5. Elastic compound for metal sash glazing.
  6. Glazing cushion.
  7. Sealing compound.
  8. Window film.
- E. Samples:
  1. Size: 150 mm by 150 mm (6 inches by 6 inches).
  2. Insulating glass units.
  3. Plastic glazing.
- F. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were

tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

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

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.
- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.
- D. Protect laminated glazing units against face and edge damage during entire sequence of fabrication, handling, and delivery to installation location.

#### **1.7 PROJECT CONDITIONS**

Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

#### **1.8 WARRANTY**

- A. Warranty: Conform to terms of "Warranty of Construction", FAR clause 52.246-21, except extend warranty period for the following:
  - 1. Insulating glass units to remain sealed for 10 years.
  - 2. Laminated glass units to remain laminated for 5 years.

#### **1.9 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American National Standards Institute (ANSI):
  - Z97.1-04.....Safety Glazing Material Used in Building -  
Safety Performance Specifications and Methods  
of Test.
- C. American Society for Testing and Materials (ASTM):
  - C1363-05.....Thermal Performance of Building Assemblies, by  
Means of A Hot Box Apparatus
  - C542-05.....Lock-Strip Gaskets.
  - C716-06.....Installing Lock-Strip Gaskets and Infill  
Glazing Materials.

- C794-06.....Adhesion-in-Peel of Elastomeric Joint Sealants.
- C864-05.....Dense Elastomeric Compression Seal Gaskets,  
Setting Blocks, and Spacers.
- C920-08.....Elastomeric Joint Sealants.
- C964-07.....Standard Guide for Lock-Strip Gasket Glazing.
- C1036-06.....Flat Glass.
- C1048-04.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated  
and Uncoated Glass.
- C1172-09.....Laminated Architectural Flat Glass.
- C1376-10.....Pyrolytic and Vacuum Deposition Coatings on  
Flat Glass.
- D635-06.....Rate of Burning and/or Extent and Time of  
Burning of Self-Supporting Plastic in a  
Horizontal Position.
- D4802-02.....Poly (Methyl Methacrylate) Acrylic Plastic  
Sheet.
- E84-09.....Surface Burning Characteristics of Building  
Materials.
- 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. Glass Association of North America (GANA):  
Glazing Manual (Latest Edition)  
Sealant Manual (2008)
- J. American Society of Civil Engineers (ASCE):  
ASCE 7-10.....Wind Load Provisions

## **PART 2 - PRODUCT**

### **2.1 GLASS**

A. Use thickness stated unless specified otherwise in assemblies.

B. Clear Glass:

1. ASTM C1036, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

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

A. Clear Heat Strengthened Glass:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

B. Clear Tempered Glass (CTG):

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

### **2.3 COATED GLASS**

A. Low-E Tempered Glass:

1. ASTM C1048, Kind FT, Condition C, Type I, Class 1, Quality q3 with low emissivity pyrolytic coating having an E of 0.15.
2. Apply coating to second surface of insulating glass units.
3. Thickness, (1/4 inch).
4. Anti-reflective low emissivity coating shall be equal to PPG Solarban 70XL.

### **2.4 PLASTIC GLAZING**

A. Plastic glazing shall be by 3 Form, or approved equal ([www.3-form.com](http://www.3-form.com)).

1. Product: Linea Ivory.
2. Gauge: 1/4-inch.
3. Front Finish: Patina.
4. Back Finish: Sandstone.
5. Edge Finishing: Eased.
6. Angled Seams: Mitered.

B. Glass stops at Operatory signage shall be by Julius Blum & Co., Inc., or approved equal ([www.juliusblum.com](http://www.juliusblum.com)).

1. Product: Glass Stop #8206 with Snap-In #8207.
2. Material and Finish: Clear anodized aluminum.

### **2.5 LAMINATED GLASS**

A. Two lites of glass bonded with an interlayer material for use in building glazing

B. Use minimum 0.75 mm (0.030 inch) thick interlayer for vertical glazing.



## 2.6 LAMINATED GLAZING ASSEMBLIES

Clear Heat Strengthened Laminated Glazing:

1. Both panes, ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
2. Thickness: Each pane 3 mm (1/8 inch) thick, with 0.75 mm (0.030 inch) thick clear polyvinyl butyral interlayer. Total thickness approximately 1/4 inch.

## 2.7 INSULATING GLASS UNITS

- A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space and comply with ASTM E2190.
- B. Clear Insulating Laminated Glazing (**CILG**):
  1. Clear insulating laminated glass units shall consist of one exterior sheet of 6 mm (1/4 inch) clear Low-E tempered glass, as specified above, and one interior sheet of 6 mm (1/4 inch) clear heat strengthened laminated glass, as specified above. The glass sheets shall be separated with a metal spacer to provide a 12 mm (1/2 inch) air space which is hermetically sealed with primary and secondary seals. The metal spacer shall contain a drying agent. Total glass unit thickness shall be nominally 24 mm (1 inch). Insulating glass unit performance shall be as follows:
    - a. U-Value / Winter Nighttime: 0.23 maximum
    - b. Shading Coefficient: 0.31
    - c. Solar Heat Gain Coefficient: 0.27 maximum
    - d. Visible Light Transmittance: 63.9%

## 2.8 WINDOW FILM

Window film for installation at certain interior windows shown on the Drawings shall be matte finish pressure-sensitive adhesive-backed film designed to give the appearance of sand-blasted glass and obscure vision into the interior spaces from the Tramway. Film shall include a peel-off liner. Film shall be removable by use of a chemical remover. Film shall be one of the following products, or approved equal:

1. Llumar NRMP52 Frosted, by CP Films, Inc.
2. Dusted and Frosted Crystal Film Series 7725SE, by 3M Scotchcal.

## 2.9 GLAZING ACCESSORIES

- A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal

accessories exposed in the finished work shall have a finish that will not corrode or stain while in service.

B. Setting Blocks: ASTM C864:

1. Channel shape; having 6 mm (1/4 inch) internal depth.
2. Shore a hardness of 80 to 90 Durometer.
3. Block lengths: 50 mm (two inches) except 100 to 150 mm (four to six inches) for insulating glass.
4. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
5. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.

C. Spacers: ASTM C864:

1. Channel shape having a 6 mm (1/4 inch) internal depth.
2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
3. Lengths: One to 25 to 76 mm (one to three inches).
4. Shore a hardness of 40 to 50 Durometer.

D. Sealing Tapes:

1. Semi-solid polymeric based material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.

E. Glazing Gaskets: ASTM C864:

1. Firm dense wedge shape for locking in sash.
2. Soft, closed cell with locking key for sash key.
3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.

F. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.

G. Glazing Sealants: ASTM C920, silicone neutral cure:

1. Type S.
2. Class 25
3. Grade NS.
4. Shore A hardness of 25 to 30 Durometer.

H. Color:

1. Color of glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted shall be black, gray, or neutral color.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Verification of Conditions:

1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer's approved shop drawings.

B. Advise Contractor of conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units to prevent damage to glass and glazing units by cleaning materials.

**3.2 PREPARATION**

- A. For sealant glazing, prepare glazing surfaces in accordance with GANA-02 Sealant Manual.
- B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.
- C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.
- D. Verify that components used are compatible.
- E. Clean and dry glazing surfaces.
- F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

**3.3 INSTALLATION - GENERAL**

- A. Install in accordance with GANA-01 Glazing Manual and GANA-02 Sealant Manual unless specified otherwise.
- B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.
- C. Set glazing without bending, twisting, or forcing of units.

- D. Do not allow glass to rest on or contact any framing member.
- E. Glaze doors and operable sashes in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.
- F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- G. Laminated Glass:
  - 1. Tape edges to seal interlayer and protect from glazing sealants.
  - 2. Do not use putty or glazing compounds.
- H. Insulating Glass Units:
  - 1. Glaze in compliance with glass manufacturer's written instructions.
  - 2. When glazing gaskets are used, they shall be of sufficient size and depth to cover glass seal or metal channel frame completely.
  - 3. Do not use putty or glazing compounds.
  - 4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.
  - 5. Install with tape or gunnable sealant in wood sash.
- G. Install Window Film per manufacturer's written instructions.

#### **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 1/3 points with edge block no more than 150 mm (6 inches) from corners.
- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
- F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line.

- G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

### **3.5 INSTALLATION - WET METHOD (SEALANT AND SEALANT)**

- A. Place setting blocks at 1/3 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 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 1/3 points with edge block no more than 150 mm (6 inches) from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.
- F. Trim protruding tape edge.

### **3.7 REPLACEMENT AND CLEANING**

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by Resident Engineer.
- B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.
- C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

### **3.8 PROTECTION**

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

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**SECTION 08 90 00  
LOUVERS AND VENTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies fixed wall louvers.

**1.2 RELATED WORK**

Color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Each type, showing material, finish, size of members, method of assembly, and installation and anchorage details.
- C. Manufacturer's Literature and Data: Each type of louver and vent.
- D. Samples:
  - 1. Two samples of organic finish of each color specified.

**1.4 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. The Master Painters Institute (MPI):  
Approved Product List - September 2011
- C. American Society for Testing and Materials (ASTM):
  - A167-99(R2009).....Stainless and Heat-Resisting Chromium - Nickel Steel Plate, Sheet, and Strip
  - A1008/A1008M-10.....Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability
  - B209/B209M-03(R2007)....Aluminum and Aluminum Alloy, Sheet and Plate
  - B221-08.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
  - B221M-07.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire Shapes, and Tubes
- D. National Association of Architectural Metal Manufacturers (NAAMM):  
AMP 500-06.....Metal Finishes Manual
- E. National Fire Protection Association (NFPA):  
90A-09.....Installation of Air Conditioning and Ventilating Systems
- 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  
 511-07.....Certified Ratings Program for Air Control  
 Devices

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Aluminum, Extruded: ASTM B221/B221M.
- B. Stainless Steel: ASTM A167, Type 302B.
- C. Carbon Steel: ASTM A1008/A1008M.
- D. Aluminum, Plate and Sheet: ASTM B209/B209M.
- E. 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.
- F. Inorganic Zinc Primer: MPI No. 19.

### **2.2 EXTERIOR WALL LOUVERS**

- A. General:
  - 1. Provide fixed type louvers of size and design shown.
  - 2. Heads, sills and jamb sections shall have formed caulking slots or be designed to retain caulking. Head sections shall have exterior drip lip, and sill sections an integral water stop.
  - 3. Furnish louvers with sill extension or separate sill as shown.
  - 4. Frame shall be mechanically fastened or welded construction with welds dressed smooth and flush.
- B. Performance Characteristics:
  - 1. Weather louvers shall have a minimum of 50-percent free area.
  - 2. Louvers shall bear AMCA certified rating seals for air performance and water penetration ratings in accordance with AMCA 500-L and AMCA 511.
- C. Aluminum Louvers:
  - 1. General: Frames, blades, sills and mullions (sliding interlocking type); 2 mm (0.081-inch) thick extruded aluminum. Blades shall be drainable type and have reinforcing bosses.
  - 2. Depth:

- a. Aluminum louvers at the Attic shall be 6-inches deep.
- b. Aluminum louvers at the First Floor shall be 4-inches deep.
- 3. Louvers, Fixed: Make frame sizes 13 mm (1/2-inch) smaller than openings. Single louver frames shall not exceed 1700 mm (66 inches) wide. When openings exceed 1700 mm (66 inches), provide twin louvers separated by mullion members.
- 4. Louvers shall have aluminum screen frame with aluminum alloy bird screening mounted on back of louver by means of 19 mm x 5 mm (3/4-inch by 3/16-inch) top and bottom bars screwed to frame.

### **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 FINISH**

- A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505
- B. Aluminum Louvers:
  - 1. Organic Finish: AAMA 2605 (Fluorocarbon coating).
- C. Sheet Steel: Baked-on or oven dried shop prime coat.
  - 1. Finish painting of exposed surfaces of shop primed louvers is specified in Section 09 91 00, PAINTING.
- D. Steel: Surfaces of steel work, for which no other finish is specified, shall be cleaned free from scale, rust, oil and grease, and then given a light colored prime paint after fabrication, except ferrous metals concealed in finished work. Paint all contact surfaces of assembled work (except welded contact surfaces) with an additional shop coat of similar paint.

### **2.5 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 organic finish is not approved.



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

- A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.
- C. Provide anchoring devices and fasteners as shown and as necessary for securing louvers to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use.
- D. Generally, set wall louvers in masonry walls during progress of the work. If wall louvers are not delivered to job in time for installation in prepared openings, make provision for later installation.

**3.2 CLEANING AND ADJUSTING**

- A. After installation, all exposed prefinished and plated items and all items fabricated from stainless steel and aluminum shall be cleaned as recommended by the manufacturer and protected from damage until completion of the project.

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**SECTION 09 06 00  
SCHEDULE FOR FINISHES**

**PART I - GENERAL**

**1.1 DESCRIPTION**

A. 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**

A. Manufacturer's trade names and numbers used herein are only to identify colors, finishes, textures and patterns. Products of other manufacturers 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**

A. 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.

**PART 2- PRODUCTS**

**2.1 DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES**

A. SECTION 06 20 00, FINISH CARPENTRY

Finish Code	Material	Manufacturer	Mfg. Color Name/No.
PL-1	Plastic Laminate	Formica	Glamour Cherry 6208-LX
PL-2	Plastic Laminate	WilsonArt	Gilded Mesh 4912-38
SS-1	Solid Polymer	Corian	Bethany

**2.2 DIVISION 08 - OPENINGS****A. SECTION 08 14 00, WOOD DOORS**

Component	Finish/Color
Wood Doors	Stain ST-1, to match Plastic Laminate PL-1

**B. SECTION 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS**

Material	Finish	Manufacturer	Mfg. Color Name/No.
Interior Aluminum Doors, Frames, and Windows	Anodized Aluminum, Clear Finish	Kawneer	N/A
Interior Aluminum Sliding Doors and Frames	Anodized Aluminum, Clear Finish	Horton Automatics	N/A
Exterior Aluminum Windows	Fluorocarbon Finish	Kawneer	Bone White

**C. SECTION 08 90 00, LOUVERS AND WALL VENTS**

Item	Material	Finish	Manufacturer	Mfg. Color Name/No.
Louvers	Aluminum	Fluorocarbon Finish	Ruskin	Bone White (24)

**2.3 DIVISION 09 - FINISHES****A. SECTION 09 51 00, ACOUSTICAL CEILINGS**

Finish Code	Component	Color and Pattern	Manufacturer	Mfg. Name/No.
ATC-1	Acoustic Ceiling Tile	White Directional Fissured	CertainTeed	FH-157
	Metal Suspension System	White	N/A	N/A

**B. SECTION 09 65 13, RESILIENT BASE AND ACCESSORIES**

Finish Code	Item	Style	Height	Profile	Manufacturer	Mfg. Color Name/No.
RB-1	Resilient Base	Pinnacle Plus	5-1/2"	#95	Roppe	624 Chameleon

## C. SECTION 09 65 16, RESILIENT SHEET FLOORING

Finish Code	Pattern	Seams	Manufacturer	Mfg. Color Name/No.
SV-1	Primus Framework	Heat Welded	Mannington	ALL107 Toasted Sesame
SV-2	Primus Lacosta	Heat Welded	Mannington	ALL134 Cherry Wood
SV-3	Primus Lacosta	Heat Welded	Mannington	ALL123 Royalty
Vinyl Edge Strip			Roppe	624 Chameleon
Heat Weld 842371	Use throughout project, unless noted otherwise.			
Heat Weld 842398	Use at seams within SV-2.			
Heat Weld 842416	Use at seams within SV-3, and at seams between SV-2 and SV-3.			

## D. SECTION 09 68 00, CARPET

Finish Code	Pattern	Manufacturer	Mfg. Color Name/No.
CPT-1	Portela	Mannington	8310 St. Lucia
Vinyl Edge Strip		Roppe	624 Chameleon

## E. SECTION 09 91 00, PAINT AND COATINGS

Paint Code	Gloss	Manufacturer	Mfg. Color Name/No.
P-1 or GP-1		Sherwin-Williams	SW7689 Row House Tan
Scuff-Resistant Paint Code	Gloss	Manufacturer	Mfg. Color Name/No.
SRP-1		Scuffmaster	To match SW7689 Row House Tan
SRP-2		Scuffmaster	Top match SW7690 Townhall Tan
SRP-3		Scuffmaster	To match SW2823 Rookwood Clay
SRP-4		Scuffmaster	To match SW7705 Wheat Penny
SRP-5		Scuffmaster	To match SW7594 Carriage Door
Stain Code	Gloss	Manufacturer	Mfg. Color Name/No.
ST-1	Satin	Sherwin-Williams	To match Plastic Laminate PL-1

**2.4 DIVISION 10 - SPECIALTIES****A. SECTION 10 11 13, MARKERBOARDS**

Item	Material	Manufacturer	Mfg. Color Name/No.
Markerboard Writing Surface	Porcelain Enamel Board with Texture Finish	Claridge	No. 75 Low Gloss White

**B. SECTION 10 14 00, INTERIOR SIGNS**

Sign Type	Component	Manufacturer	Mfg. Color Name/No.
Interior Signs	Plaque Color Center and Bottom	2/90 Sign Systems	722 Beige
	Plaque Color Top	2/90 Sign Systems	157 Lead
	Type Color Center and Bottom	2/90 Sign Systems	184 Charcoal
	Type Color Top	2/90 Sign Systems	150 Silver

**C. SECTION 10 26 00, WALL AND DOOR PROTECTION**

Item	Finish Code	Style / Pattern	Manufacturer	Mfg. Color Name/No.
Corner Guards	WP-1	G100	Koroguard	Boucle'
Wall Protection Panel	WP-1		Koroguard	Boucle'
Rub Strips	WP-2	Summer Flame	Koroguard	Summer Flame WG

**D. SECTION 10 51 00, LOCKERS**

Item	Material	Manufacturer	Mfg. Color Name/No.
Lockers	Plastic Laminate	Formica	Glamour Cherry 6208-LX

**2.5 DIVISION 12 - FURNISHINGS****A. SECTION 12 24 00, WINDOW SHADES**

Component	Type	Pattern	Manufacturer	Mfg. Color Name/No.
Window Shade WS-1	10% Open	SW5053	Draper	Honeycomb / Brown Sugar
Window Shade WS-2	Blackout	SunBloc SB9000	Draper	Champagne

**PART III EXECUTION****3.1 COLOR PLACEMENT**

A. The following lists of items requiring painting contains the major areas of finish work required.

Contractor shall verify the color and type of finish with Architect for any items which obviously require finish, but for which a paint color is not listed hereinafter.

B. Exterior Color Placement

- |  |                                |
|--|--------------------------------|
| 1. Existing wood window frame at new attic louver        | White to match existing finish |
| 2. Existing louvers on First Floor east elevation        | White to match new louvers     |
| 3. See Drawings for other miscellaneous finish locations |                                |

C. Interior Color Placement

- |   |   |
|---|---|
| 1. GWB or concrete walls  | See Room Finish Schedule  |
| 2. GWB ceilings, soffits, and bulkheads   | See Reflected Ceiling Plan,<br>Details, and Room Finish Schedule<br>(P-2, unless noted otherwise) |
| 3. Interior hollow metal frames   | P-4   |
| 4. Wood doors   | ST-1  |
| 5. Diffusers, grilles and similar items in finished GWB walls<br>and ceilings                     | Paint to match adjacent wall or<br>ceiling  |
| 6. Wall bracket countertop supports   | Paint to match adjacent wall  |
| 7. Fire alarm bells, access doors, electrical panels, and<br>other similar items mounted in walls | Paint to match adjacent wall  |
| 8. Fire extinguisher cabinets (exterior surfaces only)  | Paint to match adjacent wall  |
| 9. See Drawings for other miscellaneous finish locations  |   |

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

- A. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- B. Ceiling suspension systems for acoustical tile or panels: Section 09 51 00, ACOUSTICAL CEILINGS.

**1.3 TERMINOLOGY**

- A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.
- C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Studs, runners and accessories.
  - 2. Hanger inserts.
  - 3. Channels (Rolled steel).
  - 4. Furring channels.
  - 5. Screws, clips and other fasteners.
- C. Shop Drawings:
  - 1. Typical ceiling suspension system.
  - 2. Typical metal stud and furring construction system including details around openings and corner details.
  - 3. Typical shaft wall assembly
  - 4. Typical fire rated assembly showing details of construction same as that used in fire rating test.
- D. Test Results: Fire rating test designation, each fire rating required for each assembly.

## 1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C754.

## 1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society For Testing And Materials (ASTM)
  - A123-09.....Zinc (Hot-dip Galvanized) Coatings on Iron and Steel Products
  - A653/A653M-09.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
  - A641-09.....Zinc-Coated (Galvanized) Carbon Steel Wire
  - C11-10.....Terminology Relating to Gypsum and Related Building Materials and Systems
  - C635-07.....Manufacture, Performance, and Testing of Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings
  - C636-06.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
  - C645-09.....Non-Structural Steel Framing Members
  - C754-09.....Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
  - C841-03 (R2008).....Installation of Interior Lathing and Furring
  - C954-07.....Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
  - C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
  - E580-09.....Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

## PART 2 - PRODUCTS

### 2.1 PROTECTIVE COATING

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



## 2.2 STEEL STUDS AND RUNNERS (TRACK)

- A. ASTM C645, modified for thickness specified and sizes as shown.
  - 1. Use ASTM A525 steel, 0.8 mm (0.0329-inch) thick bare metal (33 mil).
  - 2. Runners same thickness as studs.
- B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.
- C. Doubled studs for openings and studs for supporting concrete backer-board.
- D. Studs 3600 mm (12 feet) or less in length shall be in one piece.
- E. Shaft Wall Framing:
  - 1. Conform to rated wall construction.
  - 2. C-H Studs.
  - 3. E Studs.
  - 4. J Runners.
  - 5. Steel Jamb-Strut.

## 2.3 FURRING CHANNELS

- A. Rigid furring channels (hat shape): ASTM C645.
- B. "Z" Furring Channels:
  - 1. Not less than 0.45 mm (0.0179-inch) thick bare metal, with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.
  - 2. Web furring depth to suit thickness of insulation with slotted perforations.
- C. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

## 2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

- A. ASTM C754, except as otherwise specified.
- B. For fire rated construction: Type and size same as used in fire rating test.
- C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick: Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.
- D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.
- E. Tie Wire and Hanger Wire:
  - 1. ASTM A641, soft temper, Class 1 coating.
  - 2. Gage (diameter) as specified in ASTM C754 or ASTM C841.
- F. 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.
- G. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION CRITERIA**

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

### **3.2 INSTALLING STUDS**

- A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.
- B. Space studs not more than 610 mm (24 inches) on center.
- C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.
- D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.
- E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, sound rated partitions, and insulated exterior wall furring.
- F. At existing plaster ceilings and where shown, studs may terminate at ceiling as shown.
- G. Openings:
  1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
  2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
  3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.

## H. Fastening Studs:

1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.

## I. Chase Wall Partitions:

1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).

## J. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

**3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY**

## A. In accordance with ASTM C754 or ASTM C841, except as otherwise specified or shown.

## B. Wall furring-Stud System:

1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.

## C. Direct attachment to masonry or concrete; rigid channels or "Z" channels:

1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.
2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.
3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.
6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.

## D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.

### 3.4 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

- A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, markerboards, wall-hung casework, recessed fire extinguisher cabinets, and other items like auto door buttons and auto door operators supported by stud construction.
- B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

### 3.5 INSTALLING SHAFT WALL SYSTEM

- A. Conform to UL Design No. U415 for one-hour fire rating.
- B. Position J runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural supports with power driven fasteners at both ends and 600 mm (24 inches) on center.
- C. After liner panels have been erected, cut C-H studs and E studs, from 9 mm (3/8-inch) to not more than 13 mm (1/2-inch) less than floor-to-ceiling height. Install C-H studs between liner panels with liner panels inserted in the groove.
- D. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.
- E. Suitably frame all openings to maintain structural support for wall:
  - 1. Provide necessary liner fillers and shims to conform to label frame requirements.
  - 2. Frame openings cut within a liner panel with E studs around perimeter.
  - 3. Frame openings with vertical E studs at jambs, horizontal J runner at head and sill.

### 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 or soffits.
  - 1. Space framing at 600 mm (24-inch) centers for gypsum board anchorage.

### 3.7 TOLERANCES

- A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
- B. Plumb and align vertical members within 3 mm (1/8-inch.)
- C. Level or align ceilings within 3 mm (1/8-inch.)

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**SECTION 09 29 00  
GYPSUM BOARD**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies installation and finishing of gypsum board.

**1.2 RELATED WORK**

- A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- B. Sound deadening board: Section 07 21 13, THERMAL INSULATION.
- C. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.

**1.3 TERMINOLOGY**

- A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.
- B. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

**1.4 SUBMITTALS**

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

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

In accordance with the requirements of ASTM C840.

## 1.6 ENVIRONMENTAL CONDITIONS

In accordance with the requirements of ASTM C840.

## 1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing And Materials (ASTM):
  - C11-08.....Terminology Relating to Gypsum and Related Building Materials and Systems
  - C475-02.....Joint Compound and Joint Tape for Finishing Gypsum Board
  - C840-08.....Application and Finishing of Gypsum Board
  - C919-08.....Sealants in Acoustical Applications
  - C954-07.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Stud from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness
  - C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
  - C1047-05.....Accessories for Gypsum Wallboard and Gypsum Veneer Base
  - C1396-06.....Gypsum Board
  - E84-08.....Surface Burning Characteristics of Building Materials
- C. Underwriters Laboratories Inc. (UL):
  - Latest Edition.....Fire Resistance Directory
- D. Inchcape Testing Services (ITS):
  - Latest Editions.....Certification Listings

## PART 2 - PRODUCTS

### 2.1 GYPSUM BOARD

- A. Gypsum Board: ASTM C1396 and D3273, Mold-Resistant, Type X, 16 mm (5/8 inch) thick unless shown otherwise. Shall contain a minimum of 20 percent recycled gypsum.
- B. Coreboard or Shaft Wall Liner Panels.
  - 1. ASTM C1396, Type X.
  - 2. 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. 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.

## **2.2 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 punchouts or deformations as required to provide compound bond.
- C. Casing beads shall be Type 801-A metal trim manufactured by U.S. Gypsum or equal, for installation with the fine mesh on the exposed face.
- D. Corner beads shall be Type 800 corner beads manufactured by U.S. Gypsum or equal, for installation with the fine mesh on the exposed face.
- E. Control joints shall be formed by installing two (2) casing beads back-to-back with 1/16" gap in between.
- F. Grout for all interior door frames which occur in stud walls shall be Durabond Joint Compound manufactured by United States Gypsum Company or equal.

## **2.3 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.

## **2.4 FINISHING MATERIALS AND LAMINATING ADHESIVE**

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

# **PART 3 - EXECUTION**

## **3.1 GYPSUM BOARD HEIGHTS**

- A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:
  - 1. Two sides of partitions:
    - a. Fire rated partitions.
    - b. Smoke partitions.
    - c. Sound rated partitions.
    - d. Full height partitions shown (FHP).

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.
- 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. Use gypsum boards in maximum practical lengths to minimize number of end joints.
- D. Bring gypsum board into contact, but do not force into place.
- E. Ceilings:
  1. For single-ply construction, use perpendicular application.
- F. 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. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
  7. Control Joints; ASTM C840 and as follows:



- a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
- b. Extend control joints the full height of the wall or length of soffit/ceiling membrane.
- c. Control joints shall be placed in continuous lengths with back-to-back casing beads spaced with uniform 1/16" gap between backs. Control joints shall be placed at the following locations:
  - i. Where a wall, bulkhead or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.
  - ii. Where a wall or bulkhead runs in an uninterrupted straight plane exceeding 30 linear feet.
  - iii. Where ceiling framing members change direction.
  - iv. Where new wall, bulkhead and ceiling construction abuts existing wall, bulkhead and ceiling construction.
  - v. At other locations shown on the Drawings.
- G. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:
  - 1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
  - 2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
  - 3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.
- H. Electrical and Telecommunications Boxes:
  - 1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.
- I. Accessories:
  - 1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
  - 2. Install in one piece, without the limits of the longest commercially available lengths.
  - 3. Corner Beads:
    - a. Install at all vertical and horizontal external corners and where shown.
    - b. Use screws only. Do not use crimping tool.
  - 4. Edge Trim (casings Beads):

- a. At both sides of expansion and control joints unless shown otherwise.
- b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
- c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
- d. Where shown.

### **3.4 CAVITY SHAFT WALL**

- A. Coordinate assembly with Section 09 22 16, NON-STRUCTURAL METAL FRAMING, for erection of framing and gypsum board.
- B. Conform to UL Design No. U415 for one-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. 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.
- E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.

### **3.5 FINISHING OF GYPSUM BOARD**

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for all finished areas open to public view.
- B. Before proceeding with installation of finishing materials, assure the following:
  - 1. Gypsum board is fastened and held close to framing or furring.
  - 2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.
- C. Finish joints, fasteners, and all openings, including openings around penetrations, on gypsum board extending above suspended ceilings to seal surface of smoke barrier, fire rated or 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 or

sound rated construction. Sanding is not required above suspended ceilings.

### **3.6 REPAIRS**

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

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**SECTION 09 51 00  
ACOUSTICAL CEILINGS**

**PART 1- GENERAL**

**1.1 DESCRIPTION**

- A. Metal ceiling suspension system for acoustical ceilings.
- B. Acoustical units.

**1.2 RELATED WORK**

- A. Color, pattern, and location of each type of acoustical unit:  
Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTAL**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
  - 1. Acoustical units, each type, with label indicating conformance to specification requirements.
  - 2. Colored markers for units providing access.
- C. Manufacturer's Literature and Data:
  - 1. Ceiling suspension system, each type, showing complete details of installation.
  - 2. Acoustical units, each type
- D. Manufacturer's Certificates: Acoustical units, each type, in accordance with specification requirements.

**1.4 DEFINITIONS**

- A. Standard definitions as defined in ASTM C634.
- B. Terminology as defined in ASTM E1264.

**1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - A641/A641M-03.....Zinc-coated (Galvanized) Carbon Steel Wire
  - A653/A653M-07.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process
  - C423-07.....Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
  - C634-02 (E2007).....Standard Terminology Relating to Environmental Acoustics
  - C635-04.....Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

C636-06.....	Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
E84-07.....	Surface Burning Characteristics of Building Materials
E119-07.....	Fire Tests of Building Construction and Materials
E413-04.....	Classification for Rating Sound Insulation.
E1264-(R2005).....	Classification for Acoustical Ceiling Products

## **PART 2- PRODUCTS**

### **2.1 METAL SUSPENSION SYSTEM**

- A. ASTM C635, heavy-duty system, except as otherwise specified.
  - 1. Ceiling suspension system members may be fabricated from the following unless specified otherwise.
    - a. Galvanized cold-rolled steel, bonderized.
  - 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: 15/16".
  - 2. Fabricate wall molding and other special molding from the same material with same exposed width and finish as the exposed grid members.
  - 3. On exposed metal surfaces apply baked-on enamel flat texture finish in color to match adjacent acoustical units, unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

### **2.2 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).

### **2.3 ANCHORS AND INSERTS**

- A. Use anchors or inserts to support twice the loads imposed by hangers attached thereto.
- B. Hanger Inserts:
  - 1. Fabricate inserts from steel, zinc-coated (galvanized after fabrication).
- C. Clips:
  - 1. Galvanized steel.
  - 2. Designed to rigidly secure framing members together.
  - 3. Designed to sustain twice the loads imposed by hangers or items supported.

D. Tile Splines: ASTM C635.

## **2.4 ACOUSTICAL UNITS**

### **A. General:**

1. Ceiling Tile shall meet minimum 37-percent bio-based content in accordance with USDA Bio-Preferred Product requirements.
2. Ceiling Tile shall have a minimum recycled content of 36-percent.
3. ASTM E1264, weighing 3.6 kg/m<sup>2</sup> (3/4 psf) minimum for mineral fiber panels or tile.
4. Class A Flame Spread: ASTM 84
5. Minimum NRC (Noise Reduction Coefficient): 0.60 unless specified otherwise; ASTM C423.
6. Minimum CAC (Ceiling Attenuation Class): 33 unless specified otherwise; ASTM E413.
7. Manufacturer's standard finish; minimum Light Reflectance (LR) coefficient of 0.82 on the exposed surfaces.
8. Lay-in panels: 24" x 24", with square edges.

## **2.5 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:**

<u>Color</u> .....	<u>Service</u>
Red.....	Sprinkler System: Valves and Controls
Green.....	Domestic Water: Valves and Controls
Yellow.....	Chilled Water and Heating Water
Orange.....	Ductwork: Fire Dampers
Blue.....	Ductwork: Dampers and Controls
Black.....	Gas: Laboratory, Medical, Air and Vacuum

## **PART 3 EXECUTION**

### **3.1 CEILING TREATMENT**

- A. Treatment of ceilings shall include sides and soffits of ceiling beams, furred work 600 mm (24 inches) wide and over, and vertical surfaces at changes in ceiling heights unless otherwise shown. Install acoustic tiles after wet finishes have been installed and solvents have cured.
- B. Lay out acoustical units symmetrically about center lines of each room or space unless shown otherwise on reflected ceiling plan.
- C. Moldings:

1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.

### **3.2 CEILING SUSPENSION SYSTEM INSTALLATION**

#### **A. General:**

1. Install metal suspension system for acoustical tile and lay-in panels in accordance with ASTM C636, except as specified otherwise.
2. Use direct or indirect hung suspension system or combination thereof as defined in ASTM C635.
3. Support a maximum area of 1.48 m<sup>2</sup> (16 sf) of ceiling per hanger.
4. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
5. Provide extra hangers, minimum of one hanger at each corner of each item of mechanical, electrical and miscellaneous equipment supported by ceiling suspension system not having separate support or hangers.
6. Provide not less than 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown,
7. Use main runners not less than 1200 mm (48 inches) in length.
8. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.

#### **B. 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 center 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.

**3.3 ACOUSTICAL UNIT INSTALLATION**

- A. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
- B. Install lay-in acoustic panels in exposed grid with not less than 6 mm (1/4 inch) bearing at edges on supports.
  - 1. Install tile to lay level and in full contact with exposed grid.
  - 2. Replace cracked, broken, stained, dirty, or tile not cut for minimum bearing.
- C. 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.

**3.5 CLEAN-UP AND COMPLETION**

- A. Replace damaged, discolored, dirty, cracked and broken acoustical units.
- B. Leave finished work free from defects.

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**SECTION 09 65 13**  
**RESILIENT BASE AND ACCESSORIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies the installation of rubber base.

**1.2 RELATED WORK**

- A. Color and texture: Section 09 06 00, SCHEDULE FOR FINISHESS.
- B. Integral base with sheet flooring: Section 09 65 16, RESILIENT SHEET FLOORING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Description of each product.
  - 2. Base and stair material manufacturer's recommendations for adhesives.
  - 3. Application and installation instructions.
- C. Samples:
  - 1. Base: 150 mm (6 inches) long, each type and color.
  - 2. Adhesive: Literature indicating each type.

**1.4 DELIVERY**

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

**1.5 STORAGE**

- A. Store materials in weather tight and dry storage facility.
- B. Protect material from damage by handling and construction operations before, during, and after installation.

**1.6 APPLICABLE PUBLICATIONS**

- A. The publication listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):  
 F1861-08.....Resilient Wall Base

**PART 2 - PRODUCTS**

**2.1 GENERAL**

Use only products by the same manufacturer and from the same production run.

**2.2 RESILIENT BASE**

- A. ASTM F1861, 3 mm (1/8 inch) thick, 137 mm (5-1/2 inches) high.
- B. Use only one type of base throughout.

**2.3 ADHESIVES**

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

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

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

**3.2 INSTALLATION REQUIREMENTS**

- A. The respective manufacturer's instructions for application and installation will be considered for use when approved by the Resident Engineer.
- B. Submit proposed installation deviation from this specification to the Resident Engineer indicating the differences in the method of installation.
- C. The Resident Engineer reserves the right to have test portions of material installation removed to check for non-uniform adhesion and spotty adhesive coverage.

**3.3 PREPARATION**

- A. Examine surfaces on which material is to be installed.
- B. Clean substrate area of oil, grease, dust, paint, and deleterious substances.
- C. Substrate area dry and cured. Perform manufacturer's recommended bond and moisture test.
- D. 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.

### 3.7 CLEANING AND PROTECTION

- A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets.
- B. Clean and polish materials in the following order:
  1. After two weeks, scrub resilient base, sheet rubber and treads materials with a minimum amount of water and a mild detergent. Leave surfaces clean and free of detergent residue. Polish resilient base to a gloss finish.
- C. Where protective materials are removed and immediately prior to acceptance, replace damaged materials and re-clean resilient materials. Damaged materials are defined as having cuts, gouges, scrapes or tears and not fully adhered.

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**SECTION 09 65 16  
RESILIENT SHEET FLOORING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This Section specifies the installation of sheet flooring with backing and integral cove base.
- B. Installation of sheet flooring including following:
  - 1. Heat welded seams.
  - 2. Integral cove base installed at intersection of floor and vertical surfaces.

**1.2 RELATED WORK**

- A. Section 03 54 13, GYPSUM CEMENT UNDERLAYMENT.
- B. Color, pattern and texture: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 QUALITY CONTROL-QUALIFICATIONS:**

- A. The Contracting Officer shall approve products or service of proposed manufacturer, suppliers, and installers, and the Contractor shall submit certification that:
  - 1. Heat welded seaming is manufacturer's prescribed method of installation.
  - 2. Installer is approved by manufacturer of materials and has technical qualifications, experience, trained personnel, and facilities to install specified items.
  - 3. Manufacturer's product submitted has been in satisfactory operation, on three installations similar and equivalent in size to this project for three years. Submit list of installations.
- B. The sheet vinyl floor coverings shall meet fire performance characteristics as determined by testing products, per ASTM test method, indicated below by Underwriters Laboratories, Inc. (UL), or another recognized testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.
  - 2. Smoke Density: Less than 450 per ASTM E662.
- C. The floor covering manufacturer shall certify that products supplied for installation comply with local regulations controlling use of volatile organic compounds (VOC's).

**1.4 SUBMITTALS**

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

1. Description of resilient material and accessories to be provided.
2. Resilient material manufacturer's recommendations for adhesives, weld rods, sealants, and underlayment.
3. Application and installation instructions.

C. Samples:

1. Sheet material, 300 mm by 300 mm (12 inch by 12 inch), of each color and pattern with a welded seam using proposed welding rod.
2. Cap strip and fillet strip, 300 mm (12 inches) for integral base.
3. Shop Drawings and Certificates: Layout of joints showing patterns where joints are expressed, and type and location of obscure type joints. Indicate orientation of directional patterns.
4. Certificates: Quality Control Certificate Submittals and lists specified in paragraph, QUALIFICATIONS.
5. Edge strips: 150 mm (6 inches) long each type.

### **1.5 PROJECT CONDITIONS**

- A. Maintain temperature of floor materials and room, where work occurs, above 18 ° C (65 °F) and below 38 ° C (100 °F) for 48 hours before, during and for 48 hours after installation. After above period, room temperature shall not fall below 13 ° C (55 °F).
- B. Construction in or near areas to receive flooring work shall be complete, dry and cured. Do not install resilient flooring over slabs until they have been cured and are sufficiently dry to achieve a bond with adhesive. Follow flooring manufacturer's recommendations for bond and moisture testing.
- C. Building shall be permanently enclosed. Schedule construction so that floor receives no construction traffic when completed.

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

- A. Deliver materials to site in original sealed packages or containers; labeled for identification with manufacturer's name and brand.
- B. Deliver sheet flooring full width roll, completely enclosed in factory wrap, clearly marked with the manufacturer's number, type and color, production run number and manufacture date.
- C. Store materials in weathertight and dry storage facility. Protect from damage due to handling, weather, and construction operations before, during and after installation. Store sheet flooring on end with ambient temperatures maintained as recommended by manufacturer.
- D. Store sheet flooring on end.
- E. Move sheet vinyl floor coverings and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

## 1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society For Testing Materials (ASTM):
- E648-09.....Critical Radiant Flux of Floor-Covering Systems  
Using a Radiant Energy Source.
  - E662-09.....Specific Optical Density of Smoke Generated by  
Solid Materials.
  - F710-08.....Practice for Preparing Concrete Floors and Other  
Monolithic Floors to Receive Resilient Flooring.
  - F1303-04.....Sheet Vinyl Floor Covering with Backing.
  - F1869-04.....Moisture Vapor Emission Rate of Concrete  
Subfloor using Anhydrous Calcium Chloride
  - F2170-09.....Determining Relative Humidity in Concrete Floor  
Slabs using In-situ Probes
- C. Resilient Floor Covering Institute (RFCI):
- Recommended Work Practices for Removal of Resilient Floor Coverings.

## 1.8 SCHEDULING

Interior finish work such as plastering, drywall finishing, concrete, terrazzo, ceiling work, and painting work shall be complete and dry before installation. Mechanical, electrical, and other work above ceiling line shall be completed. Heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

## 1.9 WARRANTY:

Submit written warranty, in accordance with FAR clause 52.246-21, Warranty of Construction requirements except that warranty period shall be extended to include two (2) years.

## PART 2 - PRODUCTS

### 2.1 SHEET VINYL FLOOR COVERINGS

- A. Sheet Vinyl Floor Coverings:
1. Construction: Heterogeneous Sheet Flooring
  2. Wear Layer: Quantum Guard HP Urethane Aluminum Oxide Topcoat Cured by UV Process
  3. Size: 12 feet
  4. Wearlayer: 0.020 inches
  5. Overall Thickness: 0.080 inches
  6. Weight per Square Yard: 4.70 lbs./sq.yd.

7. Static Load Limit: 750 psi
8. ASTM Specification (F-1303): Type 1, Grade 1, Class B
9. Electrical Resistance, EN18115:  $\leq 2$  kv
10. Flooring Radiant Panel (ASTM E-648):  $\geq 0.45$  watts/sq.cm.
11. N.B.S. Smoke Chamber Test (ASTM E-662):  $< 450$  passes
12. Static Coefficient of Friction: Meets ADA Guidelines
13. FloorScore Indoor Air Quality: SCS Certified
14. CHPS 01350 Indoor Air Quality: Passed and Listed
15. Warranty: Limited 10 Year Commercial Warranty; Limited 10 Year Quantum Guard HP Finish Warranty

B. Each color and pattern of sheet flooring shall be of same production run.

## **2.2 WELDING ROD:**

A. Product of floor covering manufacturer in color matching field color of sheet vinyl covering.

## **2.3 APPLICATION MATERIALS AND ACCESSORIES**

- A. Floor and Base Adhesive: Water resistant type recommended by sheet flooring material manufacturer for conditions of use. VOC not to exceed 50g/L.
- B. Mastic Underlayment (for concrete floors): Provide products with latex or polyvinyl acetate resins in mix. Condition to be corrected shall determine type of underlayment selected for use.
- C. Primer (for concrete subfloors): As recommended by the adhesive or sheet flooring manufacturer.
- D. Base Cap Strip and Cove Strip:
  1. Extruded vinyl compatible with the sheet flooring.
  2. Cap strip "J" shape with feathered edge flange approximately 25 mm (one inch) wide; top designed to receive sheet flooring with 13 mm (1/2 inch) flange lapping top of flooring.
  3. Cove strip 70 mm (2-3/4 inch) radius.

## **2.4 EDGE STRIPS**

- A. 28 mm (1-1/8 inch) wide, 6 mm (1/4 inch) thick, bevel one edge to 3 mm (1/8 inch) thick.
- B. Bevel surface to finish flush with sheet vinyl flooring for tight joint and other side to floor finish.
- C. Resilient Edge Strip or Reducer Strip: Fed. Specs. SS-T-312, Solid vinyl.
- D. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

## **2.5 SEALANT**

- A. As specified in Section 07 92 00, JOINT SEALANTS.

- B. Compatible with sheet flooring.

### **PART 3 - EXECUTION**

#### **3.1 PROJECT CONDITIONS**

- A. Maintain temperature of sheet flooring above 36 °C (65 °F), for 48 hours before installation.
- B. Maintain temperature of rooms where sheet flooring work occurs above 36 °C (65 °F), for 48 hours, before installation and during installation.
- C. After installation, maintain temperature at or above 36 °C (65 °F.)
- D. Building is permanently enclosed.
- E. Wet construction in or near areas to receive sheet flooring is complete, dry and cured.

#### **3.2 SUBFLOOR PREPARATION**

- A. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710.
  - 1. Installer shall examine surfaces on which resilient sheet flooring is to be installed, and shall advise Contractor, in writing, of areas which are unacceptable for installation of flooring material. Installer shall advise Contractor which methods are to be used to correct conditions that will impair proper installation. Installation shall not proceed until unsatisfactory conditions have been corrected.
  - 2. Slab substrates dry, free of curing compounds, sealers, hardeners, and other materials which would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by Resilient Floor Covering Institute recommendations in manual RFCI-MRP.
- B. Broom or vacuum clean substrates to be covered by sheet vinyl floor coverings immediately before installation. Following cleaning, examine substrates to determine if there is visually any evidence of moisture, alkaline salts, carbonation, or dust.
- C. Primer: If recommended by flooring manufacturer, prior to application of adhesive, apply concrete slab primer in accordance with manufacturer's directions.
- D. Correct conditions which will impair proper installation, including trowel marks, pits, dents, protrusions, cracks or joints.
- E. Fill cracks, joints, depressions, and other irregularities in concrete with leveling compound.
  - 1. Do not use adhesive for filling or leveling purposes.



2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
  3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joint lines.
- F. Clean floor of oil, paint, dust and deleterious substances. Leave floor dry and cured free of residue from existing curing or cleaning agents.
- G. Moisture Testing: Perform moisture and pH test as recommended by the flooring and adhesive manufacturers. Perform test locations starting on the deepest part of the concrete structure. Proceed with installation only after concrete substrates meet or exceed the manufacturer's requirements. In the absence of specific guidance from the flooring or adhesive manufacturer the following requirements are to be met:
1. Perform moisture vapor emission tests in accordance with ASTM F1869. Proceed with installation only after substrates have a maximum moisture-vapor-emission rate of 1.36 kg of water/92.9 sq. m (3lb of water/1000 sq. ft.) in 24 hours.
  2. Perform concrete internal relative humidity testing using in situ probes in accordance with ASTM F2170. Proceed with installation only after concrete reaches maximum 75 percent relative humidity level measurement.

### **3.3 INSTALLATION OF FLOORING**

- A. Install work in strict compliance with manufacturer's instructions and approved layout drawings.
- B. Maintain uniformity of sheet vinyl floor covering direction and avoid cross seams.
- C. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas, but in no case less than 150 mm (6 inches) away from parallel joints in flooring substrates.
- D. Match edges of resilient floor coverings for color shading and pattern at seams.
- E. Where resilient sheet flooring abuts other flooring material floors shall finish level.
- F. Extend sheet vinyl floor coverings into toe spaces, door reveals, closets, and similar openings.
- G. Inform the Resident Engineer of conflicts between this section and the manufacturer's instructions or recommendations for auxiliary materials, or installation methods, before proceeding.
- H. Install sheet in full coverage adhesives.
  1. Air pockets or loose edges will not be accepted.

2. Trim sheet materials to touch in the length of intersection at pipes and vertical projections; seal joints at pipe with waterproof cement or sealant.
- I. Keep joints to a minimum; avoid small filler pieces or strips.
- J. Follow manufacturer's recommendations for seams at butt joints. Do not leave any open joints that would be readily visible from a standing position.
- K. Follow manufacturer's recommendations regarding pattern match, if applicable.
- L. Installation of Edge Strips:
  1. Locate edge strips under center lines of doors unless otherwise indicated.
  2. Set resilient edge strips in adhesive

### **3.4 INSTALLATION OF INTEGRAL COVED BASE**

- A. Set preformed cove to receive base. Install base material with adhesive and terminate exposed edge with cap strip. Integral base shall be 100 mm (4 inches)
- B. Internal and external corners shall be formed to geometric shape generated by cove at either square or radius corners.
- C. Heat weld joints as specified for the flooring. Seal cap strip to wall with an adhesive type sealant.
- D. Unless otherwise specified or shown where sheet flooring is scheduled, provide integral base at intersection of floor and vertical surfaces. Provide sheet flooring and base scheduled for room on floors and walls under and behind areas where casework, laboratory and pharmacy furniture and other equipment occurs, except where mounted in wall recesses.

### **3.5 WELDING**

- A. Heat weld all joints of flooring and base using equipment and procedures recommended by flooring manufacturer.
- B. Welding shall consist of routing joint, inserting a welding rod into routed space, and terminally fusing into a homogeneous joint.
- C. Upon completion of welding, surface across joint shall finish flush, free from voids, and recessed or raised areas.
- D. Fusion of Material: Joint shall be fused a minimum of 65 percent through thickness of material, and after welding shall meet specified characteristics for flooring.

### **3.6 CLEANING**

- A. Clean small adhesive marks during application of sheet flooring and base before adhesive sets, excessive adhesive smearing will not be accepted.
- B. Remove visible adhesive and other surface blemishes using methods and cleaner recommended by floor covering manufacturers.

- C. Clean and polish materials per flooring manufacturer's written recommendations.
- D. Vacuum floor thoroughly.
- E. Do not wash floor until after period recommended by floor covering manufacturer and then prepare in accordance with manufacturer's recommendations.
- F. Upon completion, Resident Engineer shall inspect floor and base to ascertain that work was done in accordance with manufacturer's printed instructions.
- G. Perform initial maintenance according to flooring manufacturer's written recommendations.

### **3.7 PROTECTION:**

- A. Protect installed flooring as recommended by flooring manufacturer against damage from rolling loads, other trades, or placement of fixtures and furnishings.
- B. Keep traffic off sheet flooring for 24 hours after installation.
- C. Where construction traffic is anticipated, cover sheet flooring with reinforced kraft paper properly secured and maintained until removal is authorized by the Resident Engineer.
- D. Where protective materials are removed and immediately prior to acceptance, repair any damage, re-clean sheet flooring, lightly re-apply polish and buff floor.

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**SECTION 09 68 00  
CARPETING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

Section specifies carpet, edge strips, adhesives, and other items required for complete installation.

**1.2 RELATED WORK**

- A. Section 03 54 13, GYPSUM CEMENT UNDERLAYMENT.
- B. Color and texture of carpet and edge strip: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Resilient wall base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

**1.3 QUALITY ASSURANCE**

- A. Carpet installed by mechanics certified by the Floor Covering Installation Board.
- B. Certify and label the carpet that it has been tested and meets criteria of CRI IAQ Carpet Testing Program for indoor air quality.

**1.4 SUBMITTALS**

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

**1.5 DELIVERY AND STORAGE**

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

**1.6 ENVIRONMENTAL REQUIREMENTS**

- A. Areas in which carpeting is to be installed shall be maintained at a temperature above 16 degrees C (60 degrees F) for 2 days before installation, during installation and for 2 days after installation. A minimum temperature of 13 degrees C (55 degrees F) shall be maintained thereafter for the duration of the contract. Traffic or movement of furniture or equipment in carpeted area shall not be permitted for 24 hours after installation. Other work which would damage the carpet shall be completed prior to installation of carpet.

**1.7 WARRANTY**

- A. Carpet and installation subject to terms of "Warranty of Construction" FAR clause 52.246-21, except that warranty period is extended to two years.

**1.8 APPLICABLE PUBLICATIONS**

- A. 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 Coverings-AATCC Crockmeter Method
- D. American Society for Testing and Materials (ASTM):  
ASTM D1335-05.....Tuft Bind of Pile Yarn Floor Coverings  
ASTM D3278-96 (R2004)...Flash Point of Liquids by Small Scale Closed-Cup Apparatus

ASTM D5116-10.....Determinations of Organic Emissions from Indoor  
Materials/Products

ASTM D5252-05.....Operation of the Hexapod Tumble Drum Tester

ASTM D5417-05.....Operation of the Vettermann Drum Tester

ASTM E648-10.....Critical Radiant Flux of Floor-Covering Systems  
Using a Radiant Heat Energy Source

E. The Carpet and Rug Institute (CRI):

CRI 104-11.....Installation of Commercial Carpet

## **PART 2 - PRODUCTS**

### **2.1 CARPET**

A. Physical Characteristics:

1. Construction: Patterned Loop
2. Face Fiber: Invista Antron Legacy Type 6,6 Four Hole, Hollow Filament Nylon, with Permanent Stain and Bleach Protection, Static Control, and Duratech Soil Resistant Treatment
3. Dye Method: Solution / Yarn
4. Gauge: 5/64
5. Stitches per Inch: 10.16
6. Pile Thickness: 0.118 inches
7. Tufted Yarn Weight: 21 ounces per square yard
8. Average Density: 6,406
9. Weight Density: 134,542
10. Primary Backing: 100% Synthetic
11. Secondary Backing: UltraBac RE with Minimum 10% Recycled Content and Lifetime Warranty Standard
12. Size: Modular Tile, 660 mm (24 inches) square tile
13. Pattern Repeat: 18-3/4" W x 33-3/4" L
14. Recycled Content: Minimum 10% Post-Consumer Recycled Content by Total Product Weight
15. NSF / ANSI-140 Certification: Platinum
16. CRI Green Label Plus ID: GLP2278
17. Warranty: Lifetime Limited Warranty, Covering Face Wear, Delamination, Tuft Bind, Unraveling, and Static Protection
18. Bleach Resistant Warranty: ColorSafe with 15 Year Limited Warranty against Color Loss from Bleach Spills
19. Stain Resistant Warranty: XGUARD with 15 Year Limited Warranty against Staining
20. CRI TM101 Appearance Rating: Heavy Traffic
21. Radiant Panel (ASTM E-648): Class I (Direct Glue)
22. Smoke Chamber (ASTM E-662): Less than 450 (Flaming Mode)

- 23. Methenamine Pill Test (ASTM D-2859): Passes
- 24. Electrostatic Propensity (AATCC): Less than 3.0 KV
- B. Color, Texture, and Pattern: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

## **2.2 ADHESIVE AND CONCRETE PRIMER**

- A. Waterproof, resistant to cleaning solutions, steam and water, nonflammable, complies with air-quality standards as specified. Adhesives flashpoint minimum 60 degrees C (140 degrees F), complies with ASTM D 3278.

## **2.3 EDGE STRIPS (MOLDING)**

- A. Vinyl Edge Strip:
  - 1. Beveled floor flange minimum 50 mm (2 inches) wide.
  - 2. Beveled surface to finish flush with carpet for tight joint and other side to floor finish.
  - 3. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

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

- A. Provide Portland cement bases polymer modifier with latex or polyvinyl acetate resin manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- B. Determine the type of underlayment selected for use by condition to be corrected.

# **PART 3 - EXECUTION**

## **3.1 SURFACE PREPARATION**

- A. Examine surfaces on which carpeting is to be installed.
- B. Clean floor of oil, waxy films, paint, dust and deleterious substances that prevent adhesion, leave floor dry and cured, free of residue from curing or cleaning agents and existing carpet materials.
- C. Correct conditions which will impair proper installation, including trowel marks, pits, dents, protrusions, cracks or joints.
- D. Fill cracks, joints depressions, and other irregularities in concrete with leveling compound.
  - 1. Do not use adhesive for filling or leveling purposes.
  - 2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
  - 3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joint lines.
- E. Test new concrete subfloor prior to adhesive application for moisture and surface alkalinity per CRI 104 Section 6.3.1 or per ASTM E1907.

### **3.2 CARPET INSTALLTION**

- A. Do not install carpet until work of other trades including painting is complete and dry.
- B. Install in accordance with CRI 104 direct glue down installation.
  - 1. Relax carpet in accordance with Section 6.4.
  - 2. Comply with indoor air quality recommendations noted in Section 6.5.
  - 3. Maintain temperature in accordance with Section 15.3.
- C. Secure carpet to subfloor of spaces with adhesive applied as recommended by carpet manufacturer.
- D. Follow carpet manufacturer's recommendations for matching pattern and texture directions.
- E. Cut openings in carpet where required for installing equipment, pipes, outlets, and penetrations.
  - 1. Use additional adhesive to secure carpets around pipes and other vertical projections.
- F. Carpet Modules:
  - 1. Install per CRI 104, Section 13, Adhesive Application.
  - 2. Lay carpet modules with pile in same direction unless specified other wise in Section 09 06 00, SCHEDULE FOR FINISHES.
  - 3. Install carpet modules so that cleaning methods and solutions do not cause dislocation of modules.
  - 4. Lay carpet modules uniformly to provide tight flush joints free from movement when subject to traffic.

### **3.3 EDGE STRIPS INSTALLATION**

- A. Install edge strips over exposed carpet edges adjacent to uncarpeted finish flooring.
- B. Anchor vinyl edge strip to floor with adhesive apply adhesive to edge strip and insert carpet into lip and press lip down over carpet.

### **3.4 PROTECTION AND CLEANING**

- A. Remove waste, fasteners and other cuttings from carpet floors.
- B. Vacuum carpet and provide suitable protection. Do not use polyethylene film.
- C. Do not permit traffic on carpeted surfaces for at least 48 hours after installation. Protect the carpet in accordance with CRI 104.
- D. Do not move furniture or equipment on unprotected carpeted surfaces.
- E. Just before final acceptance of work, remove protection and vacuum carpet clean.

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

**PART 1-GENERAL**

**1.1 DESCRIPTION**

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

**1.2 RELATED WORK**

- A. Shop prime painting of steel and ferrous metals: Division 05 - METALS, Division 08 - OPENINGS, Division 10 - SPECIALTIES, Division 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, Color, and Gloss Level of Finish Coat: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: 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, and product name and product code as of the date of contract award, which 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.

#### **1.4 DELIVERY AND STORAGE**

- A. Deliver materials to site in manufacturer's sealed container marked to show following:
  1. Name of manufacturer.
  2. Product type.
  3. Batch number.
  4. Instructions for use.
  5. Safety precautions.
- B. In addition to manufacturer's label, provide a label legibly printed as following:
  1. Federal Specification Number, where applicable, and name of material.
  2. Surface upon which material is to be applied.
  3. If paint or other coating, state coat types; prime, body or finish.
- C. Maintain space for storage, and handling of painting materials and equipment in a neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.
- D. Store materials at site at least 24 hours before using, at a temperature between 18 and 30 degrees C (65 and 85 degrees F).

#### **1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. American Conference of Governmental Industrial Hygienists (ACGIH):

- ACGIH TLV-BKLT-2012.....Threshold Limit Values (TLV) for Chemical  
Substances and Physical Agents and Biological  
Exposure Indices (BEIs)
- ACGIH TLV-DOC-2012.....Documentation of Threshold Limit Values and  
Biological Exposure Indices, (Seventh Edition)
- C. American National Standards Institute (ANSI):
- A13.1-07.....Scheme for the Identification of Piping Systems
- D. Federal Specifications (Fed Spec):
- TT-P-1411A.....Paint, Copolymer-Resin, Cementitious (For  
Waterproofing Concrete and Masonry Walls) (CEP)
- E. Master Painters Institute (MPI):
- No. 5-12.....Exterior Alkyd Wood Primer
- No. 7-12.....Exterior Oil Wood Primer
- No. 8-12.....Exterior Alkyd, Flat MPI Gloss Level 1 (EO)
- No. 9-12.....Exterior Alkyd Enamel MPI Gloss Level 6 (EO)
- No. 10-12.....Exterior Latex, Flat (AE)
- No. 11-12.....Exterior Latex, Semi-Gloss (AE)
- No. 18-12.....Organic Zinc Rich Primer
- No. 26-12.....Cementitious Galvanized Metal Primer
- No. 27-12.....Exterior / Interior Alkyd Floor Enamel, Gloss (FE)
- No. 31-12.....Polyurethane, Moisture Cured, Clear Gloss (PV)
- No. 36-12.....Knot Sealer
- No. 43-12.....Interior Satin Latex, MPI Gloss Level 4
- No. 44-12.....Interior Low Sheen Latex, MPI Gloss Level 2
- No. 45-12.....Interior Primer Sealer
- No. 46-12.....Interior Enamel Undercoat
- No. 47-12.....Interior Alkyd, Semi-Gloss, MPI Gloss Level 5 (AK)
- No. 48-12.....Interior Alkyd, Gloss, MPI Gloss Level 6 (AK)
- No. 49-12.....Interior Alkyd, Flat, MPI Gloss Level 1 (AK)
- No. 50-12.....Interior Latex Primer Sealer
- No. 51-12.....Interior Alkyd, Eggshell, MPI Gloss Level 3
- No. 52-12.....Interior Latex, MPI Gloss Level 3 (LE)
- No. 53-12.....Interior Latex, Flat, MPI Gloss Level 1 (LE)
- No. 54-12.....Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)
- No. 59-12.....Interior/Exterior Alkyd Porch & Floor Enamel, Low  
Gloss (FE)
- No. 60-12.....Interior/Exterior Latex Porch & Floor Paint, Low  
Gloss
- No. 68-12.....Interior/ Exterior Latex Porch & Floor Paint,  
Gloss
- No. 71-12.....Polyurethane, Moisture Cured, Clear, Flat (PV)

- No. 74-12.....Interior Alkyd Varnish, Semi-Gloss
- No. 77-12.....Epoxy Cold Cured, Gloss (EC)
- No. 79-12.....Marine Alkyd Metal Primer
- No. 90-12.....Interior Wood Stain, Semi-Transparent (WS)
- No. 91-12.....Wood Filler Paste
- No. 94-12.....Exterior Alkyd, Semi-Gloss (EO)
- No. 95-12.....Fast Drying Metal Primer
- No. 98-12.....High Build Epoxy Coating
- No. 101-12.....Epoxy Anti-Corrosive Metal Primer
- No. 108-12.....High Build Epoxy Coating, Low Gloss (EC)
- No. 114-12.....Interior Latex, Gloss (LE) and (LG)
- No. 119-12.....Exterior Latex, High Gloss (acrylic) (AE)
- No. 135-12.....Non-Cementitious Galvanized Primer
- No. 138-12.....Interior High Performance Latex, MPI Gloss Level 2  
(LF)
- No. 139-12.....Interior High Performance Latex, MPI Gloss Level 3  
(LL)
- No. 140-12.....Interior High Performance Latex, MPI Gloss Level 4
- No. 141-12.....Interior High Performance Latex (SG) MPI Gloss  
Level 5

H. Steel Structures Painting Council (SSPC):

- SSPC SP 1-04 (R2004)....Solvent Cleaning
- SSPC SP 2-04 (R2004)....Hand Tool Cleaning
- SSPC SP 3-04 (R2004)....Power Tool Cleaning

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

A. Conform to the coating specifications and standards referenced in PART 3.

B. Plastic Tape:

- 1. Pigmented vinyl plastic film in colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES or specified.
- 2. Pressure sensitive adhesive back.
- 3. Widths as shown.

C. Identity markers options:

- 1. Pressure sensitive vinyl markers.
- 2. Snap-on coil plastic markers.

### **2.2 MANUFACTURERS**

A. Acceptable manufacturers are as follows (or approved equal):

- 1. Benjamin Moore and Company
- 2. Diamond Vogel

3. ICI Dulux Paints
4. Kwal Paint
5. Pittsburgh Paints; PPG Industries, Inc.
6. Pratt and Lambert
7. Sherwin-Williams Company
8. Tnemec Co., Inc.

- B. The Contractor shall have the option of using materials manufactured by any one of the above manufacturers, or approved equal. Materials used throughout shall be the products of one manufacturer only, and shall be first line and top grade materials produced by the manufacturer selected. The mentioning of a specific brand name is done to establish a minimum acceptable standard or quality desired.

## **2.2 PAINT PROPERTIES**

- A. Use ready-mixed (including colors), except for two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.
- B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.

## **2.3 REGULATORY REQUIREMENTS/QUALITY ASSURANCE**

- A. Paint materials shall conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
  1. Volatile Organic Compounds (VOC): VOC content of paint materials shall not exceed 10g/l for interior latex paints/primers and 50g/l for exterior latex paints and primers.
  2. Lead-Base Paint:
    - a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
    - b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
    - c. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
  3. Asbestos: Materials shall not contain asbestos.
  4. Chromate, Cadmium, Mercury, and Silica: Materials shall not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
  5. Human Carcinogens: Materials shall not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.

6. Use high performance acrylic paints in place of alkyd paints, where possible.
7. VOC content for solvent-based paints shall not exceed 250g/l and shall not be formulated with more than one percent aromatic hydro carbons by weight.

### **PART 3 - EXECUTION**

#### **3.1 JOB CONDITIONS**

- A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.
  1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
  2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each days work.
- B. Atmospheric and Surface Conditions:
  1. Do not apply coating when air or substrate conditions are:
    - a. Less than 3 degrees C (5 degrees F) above dew point.
    - b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.
  2. Maintain interior temperatures until paint dries hard.
  3. Do no exterior painting when it is windy and dusty.
  4. Do not paint in direct sunlight or on surfaces that the sun will soon warm.
  5. Apply only on clean, dry and frost free surfaces except as follows:
    - a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces where allowed by manufacturer's printed instructions.
    - b. Dampened with a fine mist of water on hot dry days concrete and masonry surfaces to which water thinned acrylic and cementitious paints are applied to prevent excessive suction and to cool surface.
  6. Varnishing:
    - a. Apply in clean areas and in still air.
    - b. Before varnishing vacuum and dust area.
    - c. Immediately before varnishing wipe down surfaces with a tack rag.

#### **3.2 SURFACE PREPARATION**

- A. Method of surface preparation is optional, provided results of finish painting produce solid even color and texture specified with no overlays.

## B. General:

1. Remove prefinished items not to be painted such as lighting fixtures, escutcheon plates, hardware, trim, and similar items for reinstallation after paint is dried.
2. Remove items for reinstallation and complete painting of such items and adjacent areas when item or adjacent surface is not accessible or finish is different.
3. See other sections of specifications for specified surface conditions and prime coat.
4. Clean surfaces for painting with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry.

## C. Wood:

1. Sand to a smooth even surface and then dust off.
2. Sand surfaces showing raised grain smooth between each coat.
3. Wipe surface with a tack rag prior to applying finish.
4. Surface painted with an opaque finish:
  - a. Coat knots, sap and pitch streaks with MPI 36 (Knot Sealer) before applying paint.
  - b. Apply two coats of MPI 36 (Knot Sealer) over large knots.
5. After application of prime or first coat of stain, fill cracks, nail and screw holes, depressions and similar defects with wood filler paste. Sand the surface to make smooth and finish flush with adjacent surface.
6. Before applying finish coat, re-apply 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).

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. Gypsum Plaster and Gypsum Board:
1. Remove efflorescence, loose and chalking plaster or finishing materials.
  2. Remove dust, dirt, and other deterrents to paint adhesion.
  3. Fill holes, cracks, and other depressions with 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.
  - 1. Back-roll gypsum board walls and ceilings that are sprayed.
- 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 items specified in WORK NOT PAINTED, including motors, controls, telephone and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.
- I. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

### **3.5 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. Refinish areas as specified for new work to match adjoining work, unless specified or scheduled otherwise.

- G. Sand or dull glossy surfaces prior to painting.
- H. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

### 3.6 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.

### 3.7 EXTERIOR FINISHES

#### EXISTING FERROUS METAL

1 coat	3-4 dry mils	Tnemec Series 135 Chembuild
1 coat	2-3 dry mils	Tnemec Series 750 Endura-Shield with Ultraviolet Inhibitors; Semi-Gloss

#### NEW FERROUS METAL AND NON-PRE-FINISHED ALUMINUM ITEMS

1 coat	2.5-3.5 dry mils	Tnemec Series 90-97 Tneme-Zinc
1 coat	3-4 dry mils	Tnemec Series N69 Hi-Build Epoxoline II
1 coat	2.5-3.5 dry mils	Tnemec Series 750 Endura-Shield with Ultraviolet Inhibitors; Semi-Gloss

#### WOOD TRIM AND SOFFIT PANELING MATERIAL

1 coat	4 mils wet, 1.4 mils dry	Sherwin-Williams A-100 Exterior Latex Wood Primer, B42W41
2 coats	7 mils wet, 2.8 mils dry / coat	S-W Duration Exterior Latex Acrylic Satin Coating, K33 Series

### 3.8 INTERIOR FINISHES

#### FERROUS METAL AND ALUMINUM ITEMS

1 coat	4 mils wet, 1.2 mils dry	Sherwin-Williams Kem Bond HS Universal Metal Primer, B50 Series
2 coats	4 mils wet, 1.6 mils dry / coat	S-W All Surface Enamel Alkyd Eg-Shel, A11 Series

#### EXISTING GYPSUM WALLBOARD AND PLASTER

2 coats 4 mils wet, 1.6 mils dry / coat S-W ProMar 200 Latex Eg-Shel Enamel, B20W2200

NEW GYPSUM WALLBOARD

1 coat 4 mils wet, 1.2 mils dry S-W PrepRite 200 Latex Primer, B28W8200

2 coats 4 mils wet, 1.6 mils dry / coat S-W ProMar 200 Latex Eg-Shel Enamel, B20W2200

NEW AND EXISTING GYPSUM WALLBOARD SCHEDULED TO RECEIVE SCUFF-RESISTANT PAINT (SRP) FINISH (NO SUBSTITUTIONS)

1 coat 3.5 mils wet, 1.0 mils dry Scuffmaster Primemaster Primer/Sealer (Acrylic Latex)

2 coats Apply in a continuous, even film at manufacturer-specified coverage rate Scuffmaster ScrubTough Water-Based Two-Component Polyurethane-Fortified Coating

NEW GYPSUM WALLBOARD SCHEDULED TO RECEIVE GLAZED PAINT (GP) FINISH

1 coat 4 mils wet, 1.2 mils dry S-W PrepRite 200 Latex Wall Primer, B28W200

2 coat 4 mils wet, 2 mils dry / coat S-W ProMar 200 Alkyd Eg-Shel B33 Series

WOOD AND MDO PLYWOOD FOR PAINTED FINISH

1 coat 4 mils wet, 1 mil dry S-W Wall and Wood Primer, B49W2

2 coats 4 mils wet, 1.6 mils dry / coat S-W ProMar 200 Latex Eg-Shel Enamel, B20W200

HARDWOOD FOR TRANSPARENT STAINED FINISH

1 coat Penetrating Stain

2 coats S-W Wood Classics Waterborne Polyurethane Varnish, Satin finish

**3.9 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE**

- A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.
- B. In spaces not scheduled to be finish painted in Section 09 06 00, SCHEDULE FOR FINISHES, paint as specified under paragraph H, colors.
- C. Paint various systems specified in Division 21 - FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 - HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 - ELECTRONIC SAFETY AND SECURITY.
- D. Paint after tests have been completed.
- E. Omit prime coat from factory prime-coated items.

- F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.
- G. Omit field painting of items specified in paragraph BUILDING AND STRUCTURAL WORK NOT PAINTED.
- H. Color:
  - 1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
  - 2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:
    - a. White: Exterior unfinished surfaces of enameled plumbing fixtures; insulation coverings on breeching and uptake inside boiler house; drums and drum-heads; oil heaters; condensate tanks; and condensate piping.
    - b. Gray: Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces); and water and sewage treatment equipment and sewage ejection equipment.
    - c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings, including supporting doors and door frames and fuel oil burning equipment; and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).
    - d. Federal Safety Red: Exposed fire protection piping hydrants; post indicators; electrical conduits containing fire alarm control wiring; and fire alarm equipment.
    - e. Federal Safety Orange: Entire lengths of electrical conduits containing feeders 600 volts or more.
    - f. Color to Match Brickwork: Sheet metal covering on breeching outside of exterior wall of boiler house.
- I. Apply paint systems on properly prepared and primed surface.

### **3.10 BUILDING AND STRUCTURAL WORK FIELD PAINTING**

- A. Painting and finishing of interior and exterior work except as specified below.
  - 1. Painting and finishing of new and existing work, including colors and gloss of finish selected, is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.
  - 2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
  - 3. Painting of ferrous metal and galvanized metal.

4. Identity painting and safety painting.
- B. Building and Structural Work not Painted:
  1. Prefinished items:
    - a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
    - b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
  2. Finished surfaces:
    - a. Hardware except ferrous metal.
    - b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
    - c. Signs, fixtures, and other similar items integrally finished.
  3. Concealed surfaces:
    - a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, and attics, except as otherwise specified.
    - b. Inside walls or other spaces behind access doors or panels.
    - c. Surfaces concealed behind permanently installed casework and equipment.
  4. Moving and operating parts:
    - a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
    - b. Tracks for overhead or coiling doors, shutters, and grilles.
  5. Labels:
    - a. Code required label, such as Underwriters Laboratories Inc., Inchcape Testing Services, Inc., or Factory Mutual Research Corporation.
    - b. Identification plates, instruction plates, performance rating, and nomenclature.
  6. Galvanized metal:
    - a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
    - b. Gas Storage Racks.
    - c. Except where specifically specified to be painted.
  7. Metal safety treads and nosings.
  8. Gaskets.
  9. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundations walls and interior walls in pipe basements.
  10. Face brick.
  11. Structural steel encased in concrete, masonry, or other enclosure.

12. Ceilings, walls, and columns in interstitial spaces.

13. Ceilings, walls, and columns in pipe basements.

### 3.11 IDENTITY PAINTING SCHEDULE

- A. Identify designated service in accordance with ANSI A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels.
1. Legend may be identified using 2.1.G options, or by stencil applications.
  2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12 000 mm (40 feet) apart on straight runs of piping. Identification next to plumbing fixtures is not required.
  3. Locate legends clearly visible from operating position.
  4. Use arrow to indicate direction of flow.
  5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on drawings where asterisk appears for High, Medium, and Low Pressure designations as follows:
    - a. High Pressure - 414 kPa (60 psig) and above.
    - b. Medium Pressure - 104 to 413 kPa (15 to 59 psig).
    - c. Low Pressure - 103 kPa (14 psig) and below.
    - d. Add Fuel oil grade numbers.
  6. Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Blow-off		Yellow	Black	Blow-off
Boiler Feedwater		Yellow	Black	Blr Feed
A/C Condenser Water Supply		Green	White	A/C Cond Wtr Sup
A/C Condenser Water Return		Green	White	A/C Cond Wtr Ret
Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Shop Compressed Air		Yellow	Black	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower
High Pressure Steam		Yellow	Black	H.P. _____ *
High Pressure Condensate Return		Yellow	Black	H.P. Ret _____ *
Medium Pressure Steam		Yellow	Black	M. P. Stm _____ *

Medium Pressure Condensate Return		Yellow	Black	M.P. Ret _____ *
Low Pressure Steam		Yellow	Black	L.P. Stm _____ *
Low Pressure Condensate Return		Yellow	Black	L.P. Ret _____ *
High Temperature Water Supply		Yellow	Black	H. Temp Wtr Sup
High Temperature Water Return		Yellow	Black	H. Temp Wtr Ret
Hot Water Heating Supply		Yellow	Black	H. W. Htg Sup
Hot Water Heating Return		Yellow	Black	H. W. Htg Ret
Gravity Condensate Return		Yellow	Black	Gravity Cond Ret
Pumped Condensate Return		Yellow	Black	Pumped Cond Ret
Vacuum Condensate Return		Yellow	Black	Vac Cond Ret
Fuel Oil - Grade		Green	White	Fuel Oil-Grade ____ *
Boiler Water Sampling		Yellow	Black	Sample
Chemical Feed		Yellow	Black	Chem Feed
Continuous Blow-Down		Yellow	Black	Cont. B D
Pumped Condensate		Black		Pump Cond
Pump Recirculating		Yellow	Black	Pump-Recirc.
Vent Line		Yellow	Black	Vent
Alkali		Yellow	Black	Alk
Bleach		Yellow	Black	Bleach
Detergent		Yellow	Black	Det
Liquid Supply		Yellow	Black	Liq Sup
Reuse Water		Yellow	Black	Reuse Wtr
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water		Green	White	RG
Reverse Osmosis		Green	White	RO
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Chemical Resistant Pipe				
Waste		Yellow	Black	Acid Waste
Vent		Yellow	Black	Acid Vent

Atmospheric Vent	Green	White	ATV
Silver Recovery	Green	White	Silver Rec
Oral Evacuation	Green	White	Oral Evac
Fuel Gas	Yellow	Black	Gas
Fire Protection Water			
Sprinkler	Red	White	Auto Spr
Standpipe	Red	White	Stand
Sprinkler	Red	White	Drain

7. Electrical conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6100 mm (20 foot) intervals in between. Use labels with yellow background with black border and words DANGER HIGH VOLTAGE CLASS.
8. See Sections for methods of identification, legends, and abbreviations of the following:
  - a. Dental compressed air lines: Section 22 61 13.74, DENTAL COMPRESSED-AIR PIPING.
  - b. Laboratory gas and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
  - c. Oral evacuation lines: Section 22 62 19.74, DENTAL VACUUM AND EVACUATION EQUIPMENT.
  - d. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.

B. Fire and Smoke Partitions:

1. Identify partitions above ceilings on both sides of partitions, except within shafts, in letters not less than 64 mm (2 1/2 inches) high.
2. Stenciled message: "SMOKE BARRIER" or "FIRE BARRIER" as applicable.
3. Locate not more than 6100 mm (20 feet) on center on corridor sides of partitions, and with at 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.

### **3.12 PROTECTION CLEAN UP, AND TOUCH-UP**

- A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.
- C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

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**SECTION 10 11 13**  
**MARKERBOARDS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies markerboards and related items.
- B. Boards shall be factory assembled.

**1.2 RELATED WORK**

Color of markerboard writing surface: Section 09 06 00, SCHEDULE FOR FINISHES

**1.3 QUALITY ASSURANCE**

Boards shall be the products of one manufacturer.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Shop Drawings: Identifying all parts by name and material and showing design, construction, installation, anchorage and relation to adjacent construction.
- C. Manufacturer's Literature and Data:
  - 1. Markerboard
- D. Samples:
  - 1. Markerboard writing surface, 300 by 300 mm (six by six inches), each color, mounted on backing.
  - 2. Integrally colored anodized aluminum, 300 mm (six inch) length.
  - 3. Each accessory (after approval, may be used in the work).

**1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - B221/B221M-08.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
  - F104-03(R2009).....Nonmetallic Gasket Materials
- C. Composite Panel Association (CPA):
  - A208.1-09.....Particleboard
  - A135.4-04.....Basic Hardboard
- D. Porcelain Enamel Institute (PEI)
  - 1001-11.....Architectural Porcelain Enamel

## **PART 2 - PRODUCTS**

### **2.1 MARKERBOARD**

Markerboards shall consist of a writing surface, snap on aluminum frame, trough, display rail and accessories, grounds and other items specified and shown.

### **2.2 FABRICATION**

#### **A. Materials:**

1. Aluminum, extruded: ASTM B221.
2. Backing: Hardboard, AHBA A135.4 or particleboard, CPA A208.1.

#### **B. Components:**

1. Writing Surface: Factory assembly consisting of face sheet of 24 gauge sheet steel with porcelain enamel board texture finish conforming to PEI 1001, laminated to a hardboard or particleboard backing, 9 mm to 13 mm (3/8 to 1/2-inch) thick, and a 0.13 mm (0.005-inch) thick aluminum foil back sheet laminated to back-face.
2. Frames (Trim): Extruded aluminum, 1.5 mm (0.060-inch) thick, snap-on type, approximate face width 44 mm (1-3/4 inch), depth and configuration as required to return to wall and engage clips.
3. Trough: Extruded aluminum, 2.34 mm (0.092-inch) thick, not less than 75 mm (3-inch) projection from writing surface with grooved top surface, closed ends and return to wall surface at underside. Design to be snap-on type with concealed fasteners.
4. Grounds: Continuous zinc-coated (galvanized) steel or extruded aluminum members designed to support the board writing surface and clips for snap-on frames, map rail and chalk tray.
5. Clips: Manufacturer's standard as required to support frame, mullions, display rail, and trough.

#### **C. Boards 3660 mm (12 feet) or less in length shall be in one piece.**

#### **D. Finish exposed aluminum surfaces as follows:**

1. AA 45 chemically etched medium matte, with clear anodic coating Class II Architectural, 0.4 mils thick (AA-M12C22A32).

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Install units in accordance with the manufacturer's installation instructions; use concealed fasteners.
- B. Inspect surfaces and related construction to receive units. Partitions shall have reinforcing to receive fasteners. Verify type and placement of reinforcement.

- C. Do not proceed with the installation until reinforcement is in place and surfaces are flat.
- D. Assemble units as specified by the manufacturer.

### **3.2 INSTALLATION OF CHALKBOARD AND MARKERBOARD**

- A. Mount board with adhesive and blocking pads spaced 16 inches on center each way.
- B. Grounds designed to receive clips for snap-on trim shall be continuous and be secured 300 mm (12 inches) on center. Space clips 300 mm (12 inches) on center.
- C. Miter trim at corners, conceal fasteners. Modify trim as required to conform to surrounding construction details.

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**SECTION 10 14 00  
SIGNAGE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies interior signage for room numbers and code required signs.

**1.2 RELATED WORK**

- A. Lighted EXIT signs for egress purposes are specified under Division 26, ELECTRICAL.
- B. Color Finish: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 MANUFACTURER'S QUALIFICATIONS**

Sign manufacturer shall provide evidence that they regularly and presently manufacture signs similar to those specified in this section as one of their principal products.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Samples: Sign panels and frames, with letters and symbols, each type. Submit 2 sets. One set of samples will be retained by Resident Engineer, other returned to Contractor.
  - 1. Sign Panel, 200 mm x 250 mm (8 inches x 10 inches), with letters.
  - 2. Color samples of each color, 150 mm x 150 mm (6 inches x 6 inches). Show anticipated range of color and texture.
  - 3. Sample of typeface, arrow and symbols in a typical full size layout.
- C. Manufacturer's Literature:
  - 1. Showing the methods and procedures proposed for the concealed anchorage of the signage system to each surface type.
  - 2. Manufacturer's printed specifications, anchorage details, installation and maintenance instructions.
- D. Sign Location Plan: Showing location, type and total number of signs required.
- E. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.
- F. Full size layout patterns for dimensional letters.

**1.5 DELIVERY AND STORAGE**

- A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.

- B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.
- C. Deliver signs only when the site and mounting services are ready for installation work to proceed.
- D. Store products in dry condition inside enclosed facilities.

#### **1.6 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):  
B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
- C. Federal Specifications (Fed Spec):  
MIL-PRF-8184F.....Plastic Sheet, Acrylic, Modified.  
MIL-P-46144C.....Plastic Sheet, Polycarbonate

#### **1.7 MINIMUM SIGN REQUIREMENTS**

- A. Permanent Rooms and Spaces:
  - 1. Tactile and Braille Characters, raised minimum 0.793 mm (1/32 in). Characters shall be accompanied by Grade 2 Braille.
  - 2. Type Styles: Characters shall be uppercase, Helvetica Medium, Helvetica Medium Condensed and Helvetica Regular.
  - 3. Character Height: Minimum 16 mm (5/8 in) high, Maximum 50 mm (2 in).
  - 4. Symbols (Pictograms): Equivalent written description shall be placed directly below symbol, outside of symbol's background field. Border dimensions of symbol background shall be minimum 150 mm (6 in) high.
  - 5. Finish and Contrast: Characters and background shall be eggshell, matte or other non-glare finish with adequate contrast with background.
  - 6. Mounting Location and Height: As shown. Mounted on wall adjacent to the latch side of the door and to avoid door swing and protruding objects.
- B. Overhead Signs:
  - 1. Type Styles: As shown. Characters shall have a width-to-height ratio between 3:5 and 1:1. Characters shall have a stroke width-to-height ratio of between 1:5 and 1:10.
  - 2. Character Height: Minimum 75 mm (3 in) high for overhead signs.
  - 3. Finish and Contrast: Same as for signs of permanent rooms and spaces.
  - 4. Mounting Location and Height: As shown.

#### **1.8 COLORS AND FINISHES:**

- A. Section 09 06 00, SCHEDULE FOR FINISHES.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Signs of type, size and design shown on the drawings and as specified.
- B. Signs complete with lettering, framing and related components for a complete installation.
- C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- D. Do not scale drawings for dimensions. Contractor to verify and be responsible for all dimensions and conditions shown by these drawings. Resident Engineer to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.
- E. The Sign Contractor, by commencing work of this section, assumes overall responsibility, as part of his warranty of work, to assure that assemblies, components and parts shown or required within the work of the section, comply with the Contract Documents. The Contractor shall further warrant that all components, specified or required to satisfactorily complete the installation are compatible with each other and with conditions of installations.

### **2.2 PRODUCTS**

- A. Aluminum:
  - 1. Sheet and Plate: ASTM B209.
  - 2. Extrusions and Tubing: ASTM B221.
- B. Cast Acrylic Sheet: MIL-PRF-8184F; Type II, class 1, Water white non-glare optically clear. Matt finish water white clear acrylic shall not be acceptable.
- C. Polycarbonate: MIL-P-46144C; Type I, class 1.
- D. Vinyl: 0.1 mm thick machine cut, having a pressure sensitive adhesive and integral colors.

### **2.3 SIGN STANDARDS**

- A. Topography:
  - 1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps as indicated in Sign Message Schedule.
  - 2. Arrow: See graphic standards in drawings.
  - 3. Letter spacing: See graphic standards on drawings.
  - 4. All text, arrows, and symbols to be provided in size, colors, typefaces and letter spacing shown. Text shall be a true, clean, accurate reproduction of typeface(s) shown. Text shown in drawings is

for layout purposes only; final text for signs is listed in Sign Message Schedule.

B. Project Colors and Finishes: See Section 09 06 00, SCHEDULE FOR FINISHES.

## **2.4 SIGN TYPES**

A. General:

1. The interior sign system is comprised of sign type families that are identified by a letter and number which identify a particular group of signs. An additional number identifies a specific type of sign within that family.

B. Interchangeable Component System:

1. Interior sign system capable of being arranged in a variety of configurations with a minimum of attachments, devices and connectors.
2. Interior sign system shall be 2/90 PLAQUES PLUS SIGN, or approved equal.
  - a. Interchangeable nature of the system shall allow for changes of graphic components of the installed sign, without changing sign in its entirety.
  - b. Component Sign System is comprised of the following primary components:
    - 1) Rail Back utilizing horizontal rails, spaced to allow for uniform, modular sizing of sign types.
    - 2) Rail Insert mounted to back of Copy Panels to allow for attachment to Rail Back.
    - 3) Copy Panels, made of a variety of materials to allow for different graphic needs.
    - 4) End Caps which interlock to Rail Back to enclose and secure changeable Copy Panels.
    - 5) Joiners and Accent Joiners connect separate Rail Backs together.
    - 6) Top Accent Bars which provide decorative trim cap that encloses the top of sign or can connect the sign to a Type 03 Room Number Sign.
  - c. Rail Back, Rail Insert and End Caps in anodized extruded aluminum to allow for tight tolerances and consistent quality of fit and finish.
  - d. Signs in system shall be convertible in the field to allow for enlargement from one size to another in height and width through use of Joiners or Accent Joiners, which connect Rail Back panels together blindly, providing a butt joint between Copy Panels. Accent Joiners shall connect Rail Backs together with a visible 3



- mm (1/8") horizontal rib, flush to the adjacent copy insert surfaces.
- e. Sign configurations shall be as shown on the Drawings.
3. Rail Back functions as internal structural member of sign using 6063T5 extruded aluminum and anodized black.
    - a. Shall accept an extruded aluminum or plastic insert on one side or on both sides, depending upon sign type.
    - b. Shall be convertible in field to allow for connection to other Rail Back panels, so that additive changes can be made to sign unit.
    - c. Rail shall allow for a variety of mounting devices including wall mounting for screw-on applications, using pressure sensitive tape, freestanding mount, ceiling mount and other mounting devices as needed.
  4. Rail Insert functions as a mounting device for Copy Panels on to the Rail Back. The Rail Insert mounts to the back of the Copy Panel with adhesive suitable for use with the particular copy insert material.
    - a. Shall allow Copy Panels to slide or snap into the horizontal Rail Back for ease of changeability.
    - b. Shall mount to the back of the Copy Panel with adhesive suitable for use with particular Copy Panel material.
  5. Copy Panels shall accept various forms of copy and graphics, and attaches to the Rail Back with the Rail Insert. Copy Panels shall be either ABS plastic with integral color or an acrylic lacquer finish; photo polymer; or, acrylic.
    - a. Interchangeable by sliding horizontally from either side of sign, and to other signs in system of equal or greater width or height.
    - b. Cleanable without use of special chemicals or cleaning solutions.
    - c. Copy Insert Materials.
      - 1) ABS Inserts - 2.3 mm (.090 inches) extruded ABS plastic core with .07 mm (.003 inches) acrylic cap bonded during extrusion/texturing process. Pressure bonded to extruded Rail Insert using adhesive. Background color is either integral or painted in acrylic lacquer. ABS inserts finished in a chromium industries #HM335RA texture pattern to prevent glare.
      - 2) Photo polymer Inserts - 3 mm (.125 inches) phenolic photo polymer with raised copy etched to 2.3 mm (.0937 inches), bonded to an ABS plastic or extruded aluminum insert with adhesive. Background color is painted in acrylic enamel.
      - 3) Changeable Paper/ Insert Holder - Extruded insert holder with integral Rail Insert for connection with structural back panel

in 6063T5 aluminum with a black anodized finish. Inserts into holder are paper with a clear 0.7 mm (.030 inches) textured cover. Background color is painted in acrylic lacquer.

- 4) Acrylic - 2 mm (.080 inches) non-glare acrylic. Pressure bonded to extruded Rail Insert using adhesive. Background color is painted in acrylic lacquer or acrylic enamel.
- 5) Extruded 6063T5 aluminum with a black anodized finish Insert Holder with integral Rail Insert for connection with Structural Back Panel to hold a 0.7 mm (.030 inches) textured polycarbonate insert and a Sliding Tile which mounts in the Inset Holder and slides horizontally.
- 6) End Caps - Extruded using 6063T5 aluminum with a natural anodized finish. End Caps interlock with Rail Back with clips to form an integral unit, enclosing and securing the changeable Copy Panels, without requiring tools for assembly.
  - a) Shall be interchangeable to either end of sign and to other signs in the system of equal height.
  - b) Mechanical fasteners shall be added to the End Caps that will secure it to Rail Back to make sign tamper resistant.
- 7) Joiners - Extruded using 6063T5 aluminum with a black anodized finish. Rail Joiners connect Rail Backs together blindly, providing a butt joint between Copy Inserts.
- 8) Accent Joiners - Extruded using 6063T5 aluminum with a natural anodized finish. Joiner shall connect Rail Backs together with a visible 3 mm (.125 inches) horizontal rib, flush to the adjacent Copy Panel surfaces.
- 9) Top Accent Rail - Extruded using 6063T5 aluminum with a natural anodized finish. Rail shall provide 3 mm (.125 inches) high decorative trim cap, which butts flush to adjacent Copy Panel and encloses top of Rail Back and Copy Panel.
- 10) Typography
  - a) Integral Tactile Copy Inserts - phenolic photo polymer etched with 2.3 mm (.0937 inches) raised copy.
  - b) Silk-screened First Surface Copy (non-tactile) - Injection molded or extruded ABS plastic or aluminum insert with first surface applied enamel silk-screened copy.

#### C. Sign Type Families 03:

1. Tactile sign is to be made from a material that provides for letters, numbers and Braille to be integral with sign plaque material such as: photosensitive polyamide resin, etched metal, sandblasted phenolic or

embossed material. Do not apply letters, numbers and Braille with adhesive.

2. Numbers, letters and Braille to be raised 0.793 mm (.0312 inches) from the background surface. The draft of the letters, numbers and Braille to be tapered, vertical and clean.
3. Braille dots are to conform with standard dimensions for literary Braille; (a) Dot base diameter: 1.5 mm (.059 inches) (b) Inter-dot spacing: 2.3 mm (.090 inches) (c) Horizontal separation between cells: 6.0 mm (.241 inches) (d) Vertical separation between cells: 10.0 mm (.395 inches)
4. Complete sign is to have an eggshell finish (11 to 19 degree on a 60 degree glossmeter).

D. Sign Type Family 04:

1. All text and graphics are to be first surface silk-screened.
2. IN-04: When a Type IN-04 is to be mounted under a Type IN03, a connecting Accent Joiner is to be used to create a singular integrated sign.

E. Sign Type Family 09:

1. All text and graphics are to be first surface silk-screened.
2. Refer to Sign Type 03 specification for tactile and Braille portion of sign.

F. Sign Type Family 16:

1. All text and graphics are to be first surface applied vinyl letters.
2. Ceiling mounted signs require mounting hardware on the sign that allows for sign disconnection, removal, reinstallation and reconnection.

G. Sign Type Family 19:

1. Dimensional letters are mill or laser cut natural anodized aluminum in the size and thickness noted in the drawings.
2. Draft of letters is perpendicular to letters face.
3. All corners such as where a letter stem and bar intersect are to be square so the letter form is accurately reproduced.

## **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 shall 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 shall 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. 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.
- G. 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.
- H. No signs are to be manufactured until final sign message schedule and location review has been completed by the Resident Engineer and forwarded to contractor.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Protect products against damage during field handling and installation. Protect adjacent existing and newly placed construction, landscaping and finishes as necessary to prevent damage during installation. Paint and touch up any exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- B. Mount signs in proper alignment, level and plumb according to the sign location plan and the dimensions given on elevation and sign location drawings. Where otherwise not dimensioned, signs shall be installed where best suited to provide a consistent appearance throughout the project. When exact position, angle, height or location is in doubt, contact Resident Engineer for clarification.
- C. Contractor shall be responsible for all signs that are damaged, lost or stolen while materials are on the job site and up until the completion and final acceptance of the job.
- D. Remove or correct signs or installation work Resident Engineer determines as unsafe or as an unsafe condition.

- E. At completion of sign installation, clean exposed sign surfaces. Clean and repair any adjoining surfaces and landscaping that became soiled or damaged as a result of installation of signs.
- F. Locate signs as shown on the Sign Location Plans.
- G. Certain signs may be installed on glass. A blank glass back up is required to be placed on opposite side of glass exactly behind sign being installed. This blank glass back up is to be the same size as sign being installed.
- H. Contractor will be responsible for verifying that behind each sign location there are no utility lines that will be affected by installation of signs. Any damage during installation of signs to utilities will be the sole responsibility of the Contractor to correct and repair.

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

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies rub strips, corner guards, and wall protection panels.

**1.2 RELATED WORK**

- A. Color and texture of 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.
  - 2. Wall protection panels.
  - 3. Rub strips.
- D. Test Report: Showing that resilient material complies with specified fire and safety code requirements.

**1.4 DELIVERY AND STORAGE**

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

**1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - 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. National Fire Protection Association (NFPA):
  - 80-10.....Standard for Fire Doors and Windows
- D. Society of American Automotive Engineers (SAE):

J 1545-05.....Instrumental Color Difference Measurement for  
Exterior Finishes.

E. Underwriters Laboratories Inc. (UL):

Annual Issue.....Building Materials Directory

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

A. 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) outside corner, 2-inch x 2-inch size.
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, cushions and base plates as required.
  2. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.

### **2.3 WALL PROTECTION PANEL**

- A. Fabricate from vinyl acrylic or polyvinyl chloride resilient material minimum 6mm (0.060 inch) thick designed especially for interior use.
- B. Provide manufacturer's standard wainscot trim at exposed top and vertical edges of wall protection panel.
- C. Provide adhesive as recommended by the resilient material manufacturer.

### **2.4 RUB STRIP**

- A. Fabricate from vinyl acrylic or polyvinyl chloride resilient material minimum 4mm (0.040 inch) thick designed especially for interior use.

- B. Provide adhesive as recommended by the resilient material manufacturer.

## **2.5 FASTENERS AND ANCHORS**

- A. Provide fasteners and anchors as required for each specific type of installation.
- B. Where type, size, spacing or method of fastening is not shown or specified, submit shop drawings showing proposed installation details.

## **2.6 FINISH**

- A. Resilient Material for Corner Guards and Wall Protection Panels:  
Embossed texture and color in accordance with SAE J 1545 and as specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Resilient Material for Rub Strips: Smooth 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 AND RUB STRIPS**

- A. Install corner guards and rub strips on walls in accordance with manufacturer's instructions.

### **3.2 WALL PROTECTION PANELS**

- A. Surfaces to receive protection shall be clean, smooth and free of obstructions.
- B. Apply with adhesive in controlled environment according to manufacturer's recommendations.

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**SECTION 10 28 00**  
**TOILET, BATH, AND LAUNDRY ACCESSORIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies manufactured items usually used in dressing rooms, toilets, baths, locker rooms and at sinks in related spaces.
- B. Items Specified:
  - 1. Paper towel dispenser.
  - 2. Combination paper towel dispenser and disposal unit.
  - 3. Toilet tissue dispenser.
  - 4. Grab bars.
  - 5. Napkin disposals
  - 6. Clothes hooks.
  - 7. Metal framed mirror.
  - 8. Cup dispensers.
  - 9. Soap dispensers.

**1.2 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
  - 1. Each product specified.
  - 2. Paper towel dispenser and combination dispenser and disposal units.
  - 3. Metal framed mirrors, showing shelf where required, fillers, and design and installation of units when installed on ceramic tile wainscots and offset surfaces.
  - 5. Grab bars, showing design and each different type of anchorage.
  - 6. Show material and finish, size of members, and details of construction, installation and anchorage of mop racks.
- C. Samples:
  - 1. One of each type of accessory specified.
  - 2. After approval, samples may be used in the work.
- D. Manufacturer's Literature and Data:
  - 1. All accessories specified.
  - 2. Show type of material, gages or metal thickness in inches, finishes, and when required, capacity of accessories.
  - 3. Show working operations of spindle for toilet tissue dispensers.
- E. Manufacturer's Certificates:
  - 1. Attesting that soap dispensers are fabricated of material that will not be affected by liquid soap or aseptic detergents, PhisoHex and solutions containing hexachlorophene.

### 1.3 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.

### 1.4 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.

### 1.5 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.

### 1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. 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
- C1048-04.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated  
and Uncoated Glass
- F446-85(R2009).....Consumer Safety Specification for Grab Bars and  
Accessories Installed in the Bathing Area.
- 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 C1048, Kind FT, Condition A, Type 1, Class 1 (use in Mental Health and Behavior Nursing Unit Psychiatric Patient Areas and Security Examination Rooms where mirrors and glass are specified).

### **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.
- G. Hot-dip galvanized steel, except stainless steel, anchors and fastening devices.
- H. Shop assemble accessories and package with all components, anchors, fittings, fasteners and keys.
- I. Key items alike.
- J. Provide templates and rough-in measurements as required.
- K. Round and deburr edges of sheets to remove sharp edges.

### **2.5 PAPER TOWEL DISPENSERS**

- A. Surface mounted type with sloping top.
- B. Dispensing capacity for 525 multi-fold or 400 C-fold paper toweling.
- C. Fabricate of stainless steel.

- D. Provide door with continuous hinge at bottom, and either spring tension cam lock or tumbler lock, keyed alike, at top and a refill sight slot in front.

## **2.6 SMALL COMBINATION PAPER TOWEL DISPENSER AND DISPOSAL UNITS**

- A. Recessed type.
- B. Dispensing capacity for 475 multi-fold or 350 C-fold paper toweling.
- C. Fabricate of stainless steel.
- D. Form face frames, from one piece.
- E. Provide each door with continuous stainless steel piano hinge and tumbler lock, keyed alike.
- F. Provide removable waste receptacle approximately 2 gallon capacity, fabricated of 0.45 mm (0.018-inch) thick stainless steel.

## **2.7 TOILET TISSUE DISPENSERS**

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

## **2.8 GRAB BARS**

- A. Federal Spec WW-P-541/8B, Type IV, bars, surface mounted, Class 2, grab bars and ASTM F446.
- B. Fabricate of stainless steel.
  - 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. Provide manufacturer's standard safety grip finish.
- E. Flange for Concealed Mounting:
  - 1. Minimum of 2.65 mm (0.1046 inch) thick, approximately 75 mm (3 inch) diameter by 13 mm (1/2 inch) deep, with provisions for not less than three set screws for securing flange to back plate.
  - 2. Insert grab bar through center of the flange and continuously weld perimeter of grab bar flush to back side of flange.
- F. In lieu of providing flange for concealed mounting, and back plate as specified, grab rail may be secured by being welded to a back plate and be covered with flange.
- G. Back Plates:
  - 1. Minimum 2.65 mm (0.1046 inch) thick metal.

2. Fabricate in one piece, approximately 6 mm (1/4 inch) deep, with diameter sized to fit flange. Provide slotted holes to accommodate anchor bolts.
3. Furnish spreaders, through bolt fasteners, and cap nuts, where grab bars are mounted on metal partitions.

## **2.9 NAPKIN DISPOSAL**

- A. Provide surface mounted units of stainless steel.
- B. Provide hinged top.

## **2.10 CLOTHES HOOKS**

- A. Fabricate hook units of 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.

## **2.11 METAL FRAMED MIRRORS**

- A. Federal Spec A-A-3002 metal frame; stainless steel, type 302 or 304.
- B. Mirror Glass:
  1. Minimum 6 mm (1/4 inch) thick.
  2. Set mirror in a protective vinyl glazing tape.
  3. Use tempered glass for mirrors.
- 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 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.
4. Attached Shelf for Mirrors:
  - a. Fabricate shelf of the same material and finish as the mirror frame.
  - b. Make shelf approximately 125 mm (five inches) in depth, and extend full width of the mirror.
  - c. Close the ends and the front edge of the shelf to the same thickness as the mirror frame width.
  - d. Form stainless steel shelf with concealed brackets to attach to mirror frame.

D. Back Plate:

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

E. Mounting Bracket:

1. Designed to support mirror tight to wall.

**2.12 CUP DISPENSERS**

- A. Provide surface mounted units of stainless steel.
- B. Dispensing capacity for 150 3-oz. paper cups.

**2.13 SOAP DISPENSERS**

- A. Surface mounted units.
- B. Government Furnished, Contractor Installed.

**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.
- 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. Align mirrors, dispensers and other accessories even and level, when installed in battery.
- G. Install accessories to prevent striking by other moving items or interference with accessibility.

### 3.3 SCHEDULE OF ACCESSORIES

- A. Scheduled accessories shall be as manufactured by Bradley Washfountain Company, unless noted otherwise. Accessories from other manufacturers are approved, provided they match the products specified below.
- B. Paper Towel Dispenser TD-1: Model 250-15.
- C. Small Combination Paper Towel Dispenser and Disposal Unit TDD-1: Model 2291.
- D. Toilet Tissue Dispenser PH-1: Model 5402.
- E. Grab Bar GB-1: Model 812-2 x length as indicated on the Drawings.
- F. Napkin Disposal ND-1: Model 4781-15.
- G. Clothes Hood RH-1: Model 9124.
- H. Metal Framed Mirror M-1: Model 7815-2, 24"W x 30"H.
- I. Cup Dispenser CD-1: Model 9495.
- J. Soap Dispenser SD-1: Government Furnished, Contractor Installed.

### 3.4 CLEANING

After installation, clean as recommended by the manufacturer and protect from damage until completion of the project.

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**SECTION 10 44 13**  
**FIRE EXTINGUISHER CABINETS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section covers recessed fire extinguisher cabinets.

**1.2 RELATED WORK**

B. Field Painting: Section 09 91 00, PAINTING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Fire extinguisher cabinet including installation instruction and rough opening required.

**1.4 APPLICATION PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Testing and Materials (ASTM):  
D4802-10.....Poly (Methyl Methacrylate) Acrylic Plastic Sheet

**PART 2 - PRODUCTS**

**2.1 FIRE EXTINGUISHER CABINET**

- A. Recessed type with flat trim of size and design shown.
- B. Fire extinguisher cabinet shall be Ambassador from J.L Industries, or approved equal. Cabinet shall be fully-recessed with 1-1/2" return trim. Door style shall be Contemporary V with clear acrylic glazing.
- C. Fire extinguisher cabinet identification shall be red letters mounted on inside surface of glazing, to read FIRE EXTINGUISHER.
- D. Cabinet size shall accommodate a 10-pound A:B:C fire extinguisher, to be provided by the Government.

**2.2 FABRICATION**

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

**2.3 FINISH**

- A. Finish interior of cabinet body with baked-on semigloss white enamel.

- B. Finish door and frame with manufacturer's standard baked-on prime coat suitable for field painting.

**PART 3 - EXECUTION**

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

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**SECTION 10 51 00**  
**LOCKERS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Provide plastic laminate-clad wood lockers, end and filler panels, and related items as specified.

**1.2 RELATED WORK**

- A. Color and texture of finish: Section 09 60 00, SCHEDULE FOR FINISHES.

**1.3 SUBMITTALS**

- A. Shop drawings showing individual locker construction, materials, dimensions, room layout, overall dimensions for installation, and installation details, including end and filler panels, trim, and accessories.
- B. Samples:
  - 1. Plastic laminate samples.
  - 2. PVC edge banding samples.

**1.4 PRODUCT HANDLING**

- A. Store lockers and related products in a dry, climate controlled area in order to protect from damage during handling.

**1.5 WARRANTY**

- A. All wood parts and hardware shall be structurally sound and free from defects in material and workmanship under normal use and service for a period of three (3) years from date of Substantial Completion. All locking mechanisms shall be warranted for one (1) year.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Plastic laminate-clad lockers shall be furnished by Legacy Lockers ([www.legacylockers.com](http://www.legacylockers.com)), or approved equal.
- B. Locker Box:
  - 1. Locker frame constructed of 5/8" stain-resistant, high-impact, high-density thermally-fused almond colored melamine with particleboard substrate. Leading edges of frame finished with 2-mm PVC edge banding to closely match locker door.
- C. Locker Doors:
  - 1. 5/8-inch industrial-grade core with 0.030-inch vertical grade plastic laminate. Door edge banded with 2-mm PVC to closely match locker door.
  - 2. Provide filler panels matching locker doors.

3. Venting: 1/2-inch openings between door and frame on locker top and bottom provide unrestricted airflow.

D. Hardware:

1. Locking System: Padlock hasp.
2. Hinges: Two (2) heavy duty, steel European concealed hinges with up to 130-degrees of door opening on all doors 42-inches or less. Three (3) hinges on all doors over 42-inches.
3. Miscellaneous Hardware: Two (2) coat hooks, chrome finish.
4. Number Disk: 1-1/2-inch chrome disk with black engraved number routed flush with locker door.

E. Style and Size:

1. Provide double tier lockers, 72-inches total height.
2. Provide 12-inch wide x 18-inch deep lockers.

## **2.2 FABRICATION**

- A. Fabricate locker parts square and rigid without warp and with the finished faces flat and free of scratches and chips.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install lockers and accessories per approved plans and manufacturer's instructions for a plumb, rigid, and flush installation.
- B. Lockers to be installed on 4-inch high, 2x wood base. Base shall extend from the wall 2-inches less than locker depth.
- C. Anchor lockers to wall studs or furring strips attached to wall through locker back and to the base through the locker floor. Attach lockers together through predrilled holes with manufacture supplied connectors.
- D. Adjust doors and hinged to accommodate uniform spacing after installation of lockers. Verify all working parts of locker including hinge and lock function. Attach number disks in specified sequence using adhesive. Clean lockers and deliver keys and pertinent information to Contracting Officer.

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**SECTION 12 24 00**  
**WINDOW SHADES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

Cloth shades are specified in this section. Window shades shall be furnished complete, including brackets, fittings and hardware.

**1.2 RELATED WORK**

A. Color of shade cloth: Section 09 06 00, SCHEDULE FOR FINISHES.

**1.3 QUALITY CONTROL**

Manufacturer's Qualification: Window shade manufacturer shall provide evidence that the manufacture of window shades are a major product, and that the window shades have performed satisfactorily on similar installations.

**1.4 SUBMITTALS**

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

B. Samples:

1. Shade cloth, each type, 600 mm (24 inch) square, including cord and ring, showing color, finish and texture.

C. Manufacturer's literature and data; showing details of construction and hardware for:

Cloth and window shades

**1.5 APPLICABLE PUBLICATIONS**

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

B. Federal Specifications (Fed. Spec.):

AA-V-00200B.....Venetian Blinds, Shade, Roller, Window, Roller, Slat, Cord, and Accessories

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

A167-99(R2009).....Stainless and heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

B221/B221M-08.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

D635-10.....Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position

D648-07.....Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position

D1784-08.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and  
Chlorinated Poly (Vinyl Chloride) (CPVC)  
Compounds

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Shade Cloth: Translucent and opaque, as specified.
- B. Staples (For Cloth Window Shades): Nonferrous metal or zinc-coated steel.
- C. Stainless Steel: ASTM A167
- D. Extruded Aluminum: ASTM B221/B221M.

### **2.3 FASTENINGS**

Zinc-coated or cadmium plated metal, aluminum or stainless steel fastenings of proper length and type. Except as otherwise specified, fastenings for use with various structural materials shall be as follows:

<b>Type of Fastening</b>	<b>Structural Material</b>
Wood screw	Wood
Tap screw	Metal
Case-hardened, self-tapping screw	Sheet Metal
Screw or bolt in expansion shields	Solid masonry
Toggle bolts	Hollow blocks, wallboard and plaster

### **2.4 FABRICATION**

- A. Fabricate cloth shades to fit measurements of finished openings obtained at site.
- B. Cloth Window Shades: Rolling type, constructed of shade cloth mounted on rollers. Shade cloth shall have plain sides, and with hem at bottom to accommodate metal slat. Separate shades are required for each individual sash within opening. Length of shades shall exceed height of window approximately 300 mm (12 inches) measured from head to sill, in addition to material required to make-up hem:
  - 1. Roller tube shall be aluminum, controlled by bead chain clutch mechanism.
  - 2. Make pull cords of No. 4 braided nylon or beaded chain having not less than 175-lbs breaking strength.
  - 3. Conceal roller within aluminum head box, concealed by fascia trim to match shade fabric.

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

- A. Cloth Window Shades: Mount window shades on end of face brackets, set on metal gussets or casing of windows as required.
  - 1. Locate rollers in level position as high as practicable at heads of windows to prevent infiltration of light over rollers.
  - 2. Place brackets and rollers so that shades will not interfere with window and screen hardware.
  - 6. Shade installation methods not specifically described are subject to approval of Resident Engineer.

**3.2 SCHEDULE OF WINDOW SHADES**

- A. Provide Window Shade WS-1 at the exterior windows in Rooms 205, 209, and 210.
- B. Provide both Window Shade WS-1 and Window Shade WS-2 at the interior windows in Room 217.

- - - E N D - - -

**SECTION 21 05 11**  
**COMMON WORK RESULTS FOR FIRE SUPPRESSION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The requirements of this Section apply to all sections of Division 21.
- B. Definitions:
  - 1. Exposed: Piping and equipment exposed to view in finished rooms.
  - 2. Option or optional: Contractor's choice of an alternate material or method.

**1.2 RELATED WORK**

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Not Used
- D. Not Used
- E. Not Used
- F. Section 05 50 00, METAL FABRICATIONS.
- G. Section 07 84 00, FIRESTOPPING.
- H. Not Used
- I. Section 07 92 00, JOINT SEALANTS.
- J. Section 09 91 00, PAINTING.
- K. Not Used
- L. Not Used
- M. Not Used
- N. Not Used

**1.3 QUALITY ASSURANCE**

- A. Products Criteria:
  - 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.
  - 2. Equipment Service: Products shall be supported by a service organization which maintains a complete inventory of repair parts and is located reasonably close to the site.
  - 3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
  - 4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.



- 5. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
- 6. Asbestos products or equipment or materials containing asbestos shall not be used.
- B. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Resident Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- C. Guaranty: In GENERAL CONDITIONS.
- D. Not Used
- E. Supports for sprinkler piping shall be in conformance with NFPA 13.
- F. Not Used

#### **1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Submit under the pertinent section rather than under this section.
  - 1. Equipment and materials identification.
  - 2. Fire-stopping materials.
  - 3. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
  - 4. Wall, floor, and ceiling plates.
- C. Coordination Drawings: Provide detailed layout drawings of all piping systems.
  - 1. Not Used
  - 2. Not Used
  - 3. Not Used
  - 4. Not Used
  - 5. Not Used
- D. Maintenance Data and Operating Instructions:
  - 1. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment.

2. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment. Include in the listing belts for equipment.

### **1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - A36/A36M-2001.....Carbon Structural Steel
  - A575-96.....Steel Bars, Carbon, Merchant Quality, M-Grades R (2002)
  - E84-2003.....Standard Test Method for Burning Characteristics of Building Materials
  - E119-2000.....Standard Test Method for Fire Tests of Building Construction and Materials
- C. National Fire Protection Association (NFPA):
  - 90A-96.....Installation of Air Conditioning and Ventilating Systems
  - 101-97.....Life Safety Code

## **PART 2 - PRODUCTS**

### **2.1 LIFTING ATTACHMENTS - NOT USED**

### **2.2 ELECTRIC MOTORS - NOT USED**

### **2.3 VARIABLE SPEED MOTOR CONTROLLERS - NOT USED**

### **2.4 EQUIPMENT AND MATERIALS IDENTIFICATION - NOT USED**

### **2.5 FIRESTOPPING**

Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping.

### **2.6 GALVANIZED REPAIR COMPOUND**

Mil. Spec. DOD-P-21035B, paint form.

### **2.7 PIPE PENETRATIONS**

- A. Install sleeves during construction for other than blocked out floor openings for risers in mechanical bays.
- B. To prevent accidental liquid spills from passing to a lower level, provide the following:
  1. For sleeves: Extend sleeve 25 mm (one inch) above finished floor and provide sealant for watertight joint.
  2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
  3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.

- C. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from this requirement must receive prior approval of Resident Engineer.
- D. Sheet Metal, Plastic, or Moisture-resistant Fiber Sleeves: Provide for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- E. Cast Iron or Zinc Coated Pipe Sleeves: Provide for pipe passing through exterior walls below grade. Make space between sleeve and pipe watertight with a modular or link rubber seal. Seal shall be applied at both ends of sleeve.
- F. Galvanized Steel or an alternate Black Iron Pipe with asphalt coating Sleeves: Provide for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. Provide sleeve for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, connect sleeve with floor plate.
- G. Brass Pipe Sleeves: Provide for pipe passing through quarry tile, terrazzo or ceramic tile floors. Connect sleeve with floor plate.
- H. Sleeves are not required for wall hydrants for fire department connections or in drywall construction.
- I. Sleeve Clearance: Sleeve through floors, walls, partitions, and beam flanges shall be one inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.
- J. Sealant and Adhesives: Shall be as specified in Section 07 92 00, JOINT SEALANTS.

## **2.8 TOOLS AND LUBRICANTS - NOT USED**

## **2.9 WALL, FLOOR AND CEILING PLATES**

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 2.4 mm (3/32-inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025-inch) for up to 80 mm (3-inch pipe), 0.89 mm (0.035-inch) for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Use also where insulation ends on exposed water supply pipe drop from overhead. Provide a

watertight joint in spaces where brass or steel pipe sleeves are specified.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Coordinate location of piping, sleeves, inserts, hangers, and equipment. Locate piping, sleeves, inserts, hangers, and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Protection and Cleaning:
  - 1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Resident Engineer. Damaged or defective items in the opinion of the Resident Engineer, shall be replaced.
  - 2. Not Used
- C. Not Used
- D. Not Used
- E. Work in Existing Building:
  - 1. Perform as specified in Article, OPERATIONS AND STORAGE AREAS, Article, ALTERATIONS, and Article, RESTORATION of the Section 01 00 00, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).
  - 2. As specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will least interfere with normal operation of the facility.
  - 3. Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Resident Engineer. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to the Resident Engineer for determination of proper design for openings through structural sections and opening layouts approval, prior to cutting or drilling into structure. After Resident Engineer's approval, carefully cut opening through construction no larger than absolutely necessary for the required installation.
- F. Not Used
- G. Not Used

H. Inaccessible Equipment:

1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Government.
2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

**3.2 MOTOR AND DRIVE ALIGNMENT - NOT USED**

**3.3 LUBRICATION - NOT USED**

**3.4 STARTUP AND TEMPORARY OPERATION - NOT USED**

**3.5 OPERATING AND PERFORMANCE TESTS**

- A. Prior to the final inspection, perform required tests as specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TESTS and submit the test reports and records to the Resident Engineer.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Government.
- C. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

**3.6 INSTRUCTIONS TO VA PERSONNEL**

Provide in accordance with Article, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.

- - - E N D - - -

**SECTION 21 08 00  
COMMISSIONING OF FIRE SUPPRESSION SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The requirements of this Section apply to all sections of Division 21.
- B. This project will have selected building systems commissioned. The complete list of equipment and systems to be commissioned is specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. The commissioning process, which the Contractor is responsible to execute, is defined in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. A Commissioning Agent (CxA) appointed by the VA will manage the commissioning process.

**1.2 RELATED WORK**

- A. Section 01 00 00 GENERAL REQUIREMENTS.
- B. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.
- C. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

**1.3 SUMMARY**

- A. This Section includes requirements for commissioning the Fire Suppression systems, subsystems and equipment. This Section supplements the general requirements specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.
- B. The commissioning activities have been developed to support the VA requirements to meet guidelines for Federal Leadership in Environmental, Energy, and Economic Performance.
- C. The commissioning activities have been developed to support delivery of project performance in accordance with the Contract Documents developed with the approval of the VA.
  - 1. Not Used
  - 2. Not Used
  - 3. Not Used
- D. Not Used

**1.4 DEFINITIONS**

- A. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for definitions.

**1.5 COMMISSIONED SYSTEMS**

- A. Commissioning of a system or systems specified in this Division is part of the construction process. Documentation and testing of these systems, as well as training of the VA's Operation and Maintenance

personnel, is required in cooperation with the VA and the Commissioning Agent.

B. The following Fire Suppression systems will be commissioned:

1. Fire Protection System (Dry-pipe fire suppression and dry system air compressors and motors.

#### **1.6 SUBMITTALS**

A. The commissioning process requires review of selected Submittals. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the VA prior to forwarding to the Contractor. Refer to Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, and SAMPLES for further details.

B. The commissioning process requires Submittal review simultaneously with engineering review. Specific submittal requirements related to the commissioning process are specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

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

#### **PART 3 - EXECUTION**

##### **3.1 PRE-FUNCTIONAL CHECKLISTS**

A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed checklists shall be submitted to the VA and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission. Refer to SECTION 01 91 00 GENERAL COMMISSIONING

REQUIREMENTS for submittal requirements for Pre-Functional Checklists, Equipment Startup Reports, and other commissioning documents.

### **3.2 CONTRACTORS TESTS**

- A. Contractor tests as required by other sections of Division 21 shall be scheduled and documented in accordance with Section 01 00 00 GENERAL REQUIREMENTS. The Commissioning Agent will witness selected Contractor tests. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

### **3.3 SYSTEMS FUNCTIONAL PERFORMANCE TESTING:**

- A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the Resident Engineer. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed. See Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS, for additional details.

### **3.4 TRAINING OF VA PERSONNEL - NOT USED**

----- END -----



**SECTION 21 10 00**  
**WATER-BASED FIRE-SUPPRESSION SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Not Used
- B. Not Used
- C. Not Used
- D. Not Used
- E. Modification of the existing sprinkler systems as indicated on the drawings.
- F. Existing piping to be reused, replaced or removed as indicated on the drawings.
- G. Not Used
- H. Not Used
- I. Not Used
- J. Painting of exposed piping and supports to follow Section 09 91 00, PAINTING.

**1.2 RELATED WORK**

- A. Treatment of penetrations through rated enclosures: Section 07 84 00, FIRESTOPPING.
- B. Not Used
- C. Painting of exposed pipe: Section 09 91 00, PAINTING.
- D. Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSION.
- E. Not Used
- F. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

**1.3 DESIGN CRITERIA**

- A. The design, materials, equipment, installation, inspection, and testing of the automatic sprinkler system shall be in accordance with the required advisory provisions of NFPA 13 and 25.
  - 1. Not Used
  - 2. Not Used
- B. Base system design hydraulic calculations using the area/density method on the following criteria and in accordance with NFPA 13 latest edition.
  - 1. Sprinkler Protection:
    - a. All patient care, treatment, offices, locker room, toilets, waiting areas, break areas, corridors and x-ray: Light hazard,

(0.10 gpm/sq. ft.) over the hydraulically most remote 140 m<sup>2</sup> (1500 sq. ft.).

- b. Not Used
- c. Mechanical Equipment Rooms, Transformer Rooms, Electrical Switchgear Rooms and Electric Closets: Ordinary Hazard, Group 1, 6.1 L/minute/m<sup>2</sup> (0.15 gpm/sq. ft.) over the hydraulically most remote 140 m<sup>2</sup> (1500 sq. ft.).
- d. Clean and soiled linen rooms, laboratories, Pharmacy and SPD areas: Ordinary Group 2, 8.1 L/minute/m<sup>2</sup> (0.20 gpm/sq. ft.) over the hydraulically most remote 140 m<sup>2</sup> (1500 sq. ft.).
- e. Not Used
- f. Not Used
- g. Not Used
- h. Not Used
- 2. Add water allowance of 15 L/s (250 gpm) for inside and outside hose streams to the sprinkler requirements at the connection to the distribution main.
- 3. Hydraulic Calculations: The calculated demand including hose stream requirements shall fall no less than 10 percent below the available supply curve.
- 4. Water Supply:
  - a. Elevation of static and elevation of residual test gauge: 600 mm (2 ft.) above site grade
  - b. Static pressure: 60 psi
  - c. Residual pressure: 50 psi
  - d. Flow: 2,535 gpm
  - e. Date: June 2012
- C. Not Used
- D. Not Used
- E. Provide a guard for each sprinkler in the janitors' closets and other areas as required by NFPA 13.
- F. Not Used
- G. Not Used

#### **1.4 QUALIFICATIONS:**

- A. Designer's Qualifications: Design work and shop drawings shall be prepared by a licensed engineer practicing in the field of Fire

Protection Engineering or a NICET (National Institute for Certification in Engineering Technologies) Level III sprinkler technician.

B. Installer's Qualifications: The installer shall possess a valid State fire protection contractor's license. The installer shall provide documentation of having successfully completed three projects of similar size and scope.

C. On-site emergency service within four hours notification.

## **1.5 SUBMITTALS**

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

B. Sprinkler design shall be done by a certified professional. All plans shall be stamped by qualified P.E.

C. Emergency service point of contact name and 24 hour emergency telephone number.

D. Manufacturer's Literature and Data:

1. Pipe and fittings.
2. Not Used
3. Drips
4. Not Used
5. Sprinklers-each type, temperature and model
6. Not Used
7. Not Used
8. Sprinkler Cabinets
9. Sprinkler Plugs
10. Not Used
11. Not Used
12. Not Used
13. Not Used
14. Not Used
15. Not Used
16. Not Used
17. Not Used
18. Not Used
19. Not Used
20. Not Used
21. Not Used
22. Not Used

## 23. Not Used

- E. Detailed drawings in accordance with NFPA 13 the latest edition.  
Drawings shall be prepared using CADD software stamped by fire protection professional engineer and include all new and existing sprinklers and piping. Use format in use at the VA medical center. Drawings are subject to change during the bidding and construction periods. Any wall and ceiling changes occurring prior to the submittal of contractors shop drawings shall be incorporated into the contractors detailed design at no additional contract cost.
- F. Hydraulic calculations for each sprinkler system in accordance with NFPA 13 latest edition.
- G. Operation and Maintenance Data:
  - 1. Not Used
  - 2. Not Used
  - 3. Not Used
  - 4. Not Used
  - 5. Not Used
  - 6. Not Used
  - 7. Not Used
  - 8. Copy of NFPA 25
- H. Recommended preventive maintenance schedule.

**1.6 AS-BUILT DOCUMENTATION**

- A. A Mylar as-built drawing and two blue-line copies shall be provided for each drawing. One copy of final CADD drawing files shall also be provided on 89 mm (3 1/2 in.), 1.44 mb diskette, for each drawing.
- B. Four sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- C. Four sets of hydraulic calculations for each sprinkler system updated to include submittal review comments and any changes to the installation which affect the calculations including one electronic set in PDF format.
- D. Four copies of the hydrostatic report and NFPA 13 material and test certificate for each sprinkler system.
- E. Four sets of operation and maintenance data updated to include submittal review comments and any equipment substitutions including one copy of NFPA 25.

F. Manufacturers' literature, hydraulic calculations, reports and operation and maintenance data shall be in a labeled 3-ring binder.

#### **1.7 WARRANTY**

- A. All work performed and materials and equipment furnished under this contract shall be free from defects for a period of one year from date of acceptance by the government.
- B. All new piping and equipment incorporated into the new system shall be hydrostatically tested and warranted as new.

#### **1.8 APPLICABLE PUBLICATIONS**

- A. 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. National Fire Protection Association (NFPA)
  - 13-2010.....Installation of Sprinkler Systems
  - 25-2011.....Inspection, Testing and Maintenance of water Based Fire Protection Systems
  - 170-2009.....Standards for Fire Safety Symbols
  - 291-2010.....Fire Flow Testing and Marking of Hydrants
- C. Underwriters Laboratories Inc. (UL)
  - 2011.....Fire Protection Equipment Directory
- D. Factory Mutual Engineering Corporation (FM)
  - 2010.....Approval Guide
- E. American Society for Testing and Materials (ASTM)
  - F442-09.....Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe
- F. American Society of Sanitary Engineering (ASSE)
  - 1015-2009.....Double Check Backflow Prevention Assembly
- G. Complete maintenance and inspection service for the sprinkler system shall be provided by a factory trained authorized representative of the manufacturer of the major equipment for a period of one year after acceptance of the entire installation by the government.
- H. Contractor shall provide all necessary test equipment, parts and labor to perform required maintenance.
- I. All inspections, testing and maintenance work required by NFPA 25 and NFPA 13 shall be provided. Work shall include operation of sprinkler system alarm and supervisory devices.

- J. Maintenance and testing shall be performed on a quarterly basis. A computerized preventive maintenance schedule shall be provided and shall describe the protocol for preventive maintenance of equipment. The schedule shall include a systematic examination, adjustment, and cleaning of all equipment.
- K. Non-included Work: Maintenance service shall not include the performance of any work due to improper use, accidents or negligence for what the contractor is not responsible.
- L. Service and emergency personnel shall report to the Engineering Office or their authorized representative upon arrival at the hospital and again upon the completion of the required work. A copy of the work ticket containing a complete description of work performed and parts replaced shall be provided.
- M. Emergency Service:
  - 1. Normal and overtime emergency call-back service shall consist of an on-site response to calls within four hours of notification.
  - 2. Overtime emergency call-back service shall be limited to minor adjustments and repairs to affect the integrity of the system.
  - 3. Not Used
- N. Not Used

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

All devices and equipment shall be Underwriters Laboratories Inc. listed for their intended purpose. All sprinklers shall be Factory Mutual approved.

### **2.2 PIPING AND FITTINGS**

- A. Not Used
- B. Not Used
- C. Not Used
- D. Sprinkler piping of a dry pipe system shall be galvanized. Schedule 40 minimum.
- E. Not Used
- F. Threaded or flanged fittings shall be ANSI B1 6.3 cast iron, class 125 minimum. Threaded fittings are not permitted on pipe with wall thickness less than schedule 40.
- G. All fittings on galvanized piping shall be galvanized in accordance with ASTM A53.

H. Slip type or clamp-on type rubber gasketed fittings shall be listed for each piping application.

I. Piping Materials Standards:

1. Ferrous piping - follow ASTM A 795 Standard
2. Welded and seamless steel pipe - follow ANSI/ASTM A 53
3. Wrought steel pipe - follow ANSI/ASME B36.10M
4. Electric resistance welded steel pipe - follow ASTM A 135
5. Seamless copper tube - follow ASTM B 75
6. Seamless copper water tube - follow ASTM B 88
7. Wrought seamless copper and copper alloy tube - follow ASTM B 251
8. Fluxes for soldering applications of copper and copper alloy tube - follow ASTM B 813
9. Brazing filler metal - follow AWS A5.8
10. Solder metal, 95-5 - follow ASTM B 32
11. Alloy material - follow ASTM B 446
12. Not Used

J. Fitting Materials Standards:

1. Cast iron threaded fitting, Class 125 and 250 - follow ASME B16.4
2. Cast iron pipe flanges and flanged fittings - follow ASME B16.1
3. Malleable iron threaded fittings, Class 150 and 300 steel - follow ASME B16.3
4. Factory made wrought steel butt-weld fittings - follow ASME B16.9
5. Butt-welding ends for pipe, valves, flanges, and fitting - follow ASME B16.25
6. Wrought copper and copper alloy solder joint pressure fittings - follow ASME B16.22
7. Cast copper alloy solder joint pressure fitting - follow ASME B16.18
8. Not Used

K. Pipe Identification - All pipe, including specially listed pipe allowed by NFPA 13, shall be marked continuously along its length by the manufacturer in such a way as to properly identify the type of pipe. Pipe identification shall include the manufacturer's name, model designation, or schedule.

## 2.3 VALVES

- A. Not Used
- B. Not Used
- C. Not Used

D. Drain Valves: Threaded bronze angle, globe, ball or butterfly, 4100 kPa (600 psi), Water or gas (WOG) equipped with reducer and hose connection with cap or connected to a drain line.

E. Self-contained Test and Drain Valve:

1. Ductile iron body with bronze "Drain" and "Test" bonnets. Acrylic sight glass for viewing test flow. Various sized orifice inserts to simulate flow through 14 mm (17/32 in.), 13 mm (1/2 in.), 12 mm (7/16 in.), and 10 mm (3/8 in.) diameter sprinklers, 32 mm (1 1/4 in.) female threaded outlets or 32 mm (1 1/4 in.) one-quarter turn locking lug outlets for plain end pipe (end preparation to be in accordance with manufacturer's recommendation).
2. Bronze body, with chrome plated bronze ball, brass stem, steel handle, Teflon seat and sight glasses. Provide valve with three position indicator plate (off, test, and drain), 6 mm (1/4 in.) tapping for pressure gage and various other orifice inserts to simulate flow through 10 mm (3/8 in.), 12 mm (7/16 in.), 13 mm (1/2 in.), and 14 mm (17/32 in.) diameter sprinklers.

F. Not Used

G. Not Used

H. Not Used

I. Not Used

## **2.4 AUTOMATIC BALL DRIPS - NOT USED**

## **2.5 FIRE DEPARTMENT SIAMESE CONNECTION - NOT USED**

## **2.6 SPRINKLERS**

- A. Quick response sprinklers shall be standard type except as noted below. The maximum distance from the deflector to finished ceiling shall be 50 mm (2 in.) for pendent sprinklers. Pendent sprinklers in finished areas shall be provided with semi-recessed adjustable screwed escutcheons and installed within the center one-third of their adjustment. The sprinkler shall be installed in the flush position with the element exposed below the ceiling line. At the specified locations, provide the following type of sprinklers. All sprinklers shall be UL listed or FM approved quick response type. Provide quick response sprinklers in all areas, except where specifically prohibited by their listing or approval, and the following:



LOCATION	TYPE
Electrical Rooms	Quick Response, Upright or Telephone Closets, Transformer Vaults Pendent Brass [93 °C (200 °F)]
All Patient Treatment Lobbies and Corridors	Quick Response, Recessed Pendent, Chrome Plated [66-74 °C [150-165 °F)]
All Areas Not Listed Above	Quick Response, Recessed Pendent, Sidewall, Chrome Plated [66-74 °C (150-165 °F)]

B. B. Do not use quick response sprinklers in the same sprinkler zone with other sprinklers types.

C. Sprinklers to be installed as per NFPA 13.

## **2.7 TOOLS AND REPLACEMENT PARTS**

A. Sprinkler Cabinet:

1. Provide a minimum 5 percent spare sprinklers with escutcheons with a minimum of two of each type/or as required by NFPA-13, whichever is more demanding.
2. Provide a minimum of two of each type sprinkler wrenches used.
3. Install cabinets in each building where directed by the Resident Engineer.
4. Spare sprinklers shall be kept in a cabinet where ambient temperatures do not exceed 100 Deg F.

B. Not Used

C. Not Used

D. Not Used

E. Provide two sprinkler plugs attached to multi-section extension poles 2400 mm (8 ft.) minimum.

## **2.8 AIR COMPRESSOR - NOT USED**

## **2.9 EXCESS PRESSURE PUMP - NOT USED**

## **2.10 FIRE PUMP - NOT USED**

## **2.11 JOCKEY PUMP - NOT USED**

## **2.12 TEST HEADER - NOT USED**

## **2.13 IDENTIFICATION SIGNS**

Provide for all new and existing riser control valves, system control valves, drain valves, test and drain connections and alarm devices with

securely attached identification signs (enamel on metal) in accordance with NFPA 13.

#### **2.14 STANDPIPE HOSE VALVE CABINETS - NOT USED**

#### **2.15 HANGERS AND EARTHQUAKE BRACING**

In accordance with NFPA 13 and 14. Comply with seismic requirements as per 15050 for seismic zone locations.

#### **2.16 WATERFLOW SWITCHES - NOT USED**

#### **2.17 VALVE SUPERVISORY SWITCHES - NOT USED**

#### **2.18 PRESSURE SWITCHES - NOT USED**

#### **2.19 WATER MOTOR GONG - NOT USED**

#### **2.20 WALL, FLOOR AND CEILING PLATES**

A. Exposed piping passing through walls, floors or ceilings shall be provided with chrome colored escutcheon plates.

B. Comply with NFPA 101 Fire Barrier Penetration codes.

#### **2.21 WET CHEMICAL EXTINGUISHING SYSTEMS - NOT USED**

#### **2.22 KITCHEN VENTILATOR HOOD FIRE PROTECTION - NOT USED**

#### **2.23 PRESSURE GAUGE - NOT USED**

#### **2.24 HANGERS**

A. Hangers shall be designed to support five times the weight of the water filled pipe plus 250 Lb (114Kg) at each point of piping support.

B. These points of support shall be adequate to support the system.

C. The spacing between hangers shall not exceed the value given for the type of pipe as indicated in NFPA 13 tables.

D. Hanger components shall be ferrous.

E. Detailed calculations shall be submitted, when required by the reviewing

Authority, showing stress developed in hangers, piping, fittings and safety factors allowed.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

A. Not Used

B. Not Used

C. Not Used

D. Piping connections:

1. Not Used

2. Not Used

E. Drains, Test Pipes and Accessories:

1. Provide drains at other locations for complete drainage of the system. Provide valve in drain lines and connect to the central drain riser.
2. Provide test pipes in accordance with NFPA 13. Test pipes shall be valved and piped to discharge through proper orifice as specified above for drains.

F. Not Used

G. Conceal all piping, except in pipe basements, stairwells and rooms without ceilings.

H. Install new piping and sprinklers aligned with natural building and other sprinklers lines. Do not install dry piping level. Dry pipes shall be sloped to drain in accordance with NFPA 13.

I. Not Used

J. Piping arrangement shall avoid contact with other piping and equipment and allow clear access to other equipment or devices requiring access or maintenance.

K. Not Used

L. Cutout disks, which are created by cutting holes in the walls of pipe for flow switches and non-threaded pipe connections, shall be affixed near to the pipe where the originated. They shall be displayed until final inspection and then removed.

M. For each new or existing fire department connection, locate the symbolic sign given in NFPA 170 a distance of 2400 to 3000 mm (8 to 10 ft.) above each connection location. The sign shall be 450 x 450 mm (18 x 18 in.) with symbol at least 350 x 350 mm (14 x 14 in.).

N. Firestopping shall comply with Section 07 84 00, FIRESTOPPING. All holes through stairways, smoke barrier walls, and fire walls shall be sealed on a daily basis.

O. Provide hydraulic design information signage as required by NFPA 13 and 14.

P. Install access doors in ceilings of rooms where above ceiling access is required.

### **3.2 TEST**

A. Automatic Sprinkler System: NFPA 13 and 25.

B. Standpipe and Hose System: NFPA 25.

C. Centrifugal Fire Pumps: NFPA 20.

**3.3 INSTRUCTIONS - NOT USED**

- - - END - - -

**SECTION 22 05 11  
COMMON WORK RESULTS FOR PLUMBING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The requirements of this Section shall apply to all sections of Division 22.
- B. Definitions:
  - 1. Exposed: Piping and equipment exposed to view in finished rooms.
  - 2. Option or optional: Contractor's choice of an alternate material or method.

**1.2 RELATED WORK**

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT.
- H. Section 07 84 00, FIRESTOPPING.
- I. Section 07 92 00, JOINT SEALANTS.
- M. Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.
- N. Section 23 09 23, DIRECT DIGITAL CONTROLS FOR HVAC.
- O. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS
- P. Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT .
- Q. Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS.

**1.3 QUALITY ASSURANCE**

- A. Products Criteria:
  - 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years.
  - 2. Equipment Service: There shall be permanent service organizations, authorized and trained by manufacturers of the equipment supplied, located within 160 km (100 miles) of the project. These organizations shall come to the site and provide acceptable service to restore operations within four hours of receipt of notification by phone, e-mail or fax in event of an emergency, such as the shut-down of equipment; or within 24 hours in a non-emergency. Names, mail and e-mail addresses and phone numbers of service organizations

- providing service under these conditions for (as applicable to the project): pumps, critical instrumentation, computer workstation and programming shall be submitted for project record and inserted into the operations and maintenance manual.
3. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
  4. The products and execution of work specified in Division 22 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments enforced by the local code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the Resident Engineer (RE)/Contracting Officers Technical Representative (COTR).
  5. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
  6. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
  7. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
  8. Asbestos products or equipment or materials containing asbestos shall not be used.
- B. Welding: Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:
1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
  2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
  3. Certify that each welder has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.

4. All welds shall be stamped according to the provisions of the American Welding Society.
- C. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Resident Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- D. Execution (Installation, Construction) Quality:
  1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract drawings and specifications shall be referred to the RE/COTR for resolution. Written hard copies or computer files of manufacturer's installation instructions shall be provided to the RE/COTR at least two weeks prior to commencing installation of any item.
- E. Guaranty: Warranty of Construction, FAR clause 52.246-21.
- F. Plumbing Systems: IPC, International Plumbing Code.

#### **1.4 SUBMITTALS**

- A. Submittals shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 05 11, COMMON WORK RESULTS FOR PLUMBING", with applicable paragraph identification.
- C. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.
- D. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- E. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.

- F. Upon request by Government, lists of previous installations for selected items of equipment shall be provided. Contact persons who will serve as references, with telephone numbers and e-mail addresses shall be submitted with the references.
- G. Manufacturer's Literature and Data: Manufacturer's literature shall be submitted under the pertinent section rather than under this section.
1. Electric motor data and variable speed drive data shall be submitted with the driven equipment.
  2. Equipment and materials identification.
  3. Fire stopping materials.
  4. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
  5. Wall, floor, and ceiling plates.
- H. Coordination Drawings: Complete consolidated and coordinated layout drawings shall be submitted for all new systems, and for existing systems that are in the same areas. The drawings shall include plan views, elevations and sections of all systems and shall be on a scale of not less than 1:32 (3/8-inch equal to one foot). Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show the proposed location and adequate clearance for all equipment, piping, pumps, valves and other items. All valves, trap primer valves, water hammer arrestors, strainers, and equipment requiring service shall be provided with an access door sized for the complete removal of plumbing device, component, or equipment. Equipment foundations shall not be installed until equipment or piping until layout drawings have been approved. Detailed layout drawings shall be provided for all piping systems. In addition, details of the following shall be provided.
1. Mechanical equipment rooms.
  2. Interstitial space.
  3. Hangers, inserts, supports, and bracing.
  4. Pipe sleeves.
  5. Equipment penetrations of floors, walls, ceilings, or roofs.
- I. Maintenance Data and Operating Instructions:
1. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment.



2. Listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment shall be provided.
3. The listing shall include belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

##### **A. Protection of Equipment:**

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
2. Damaged equipment shall be replaced with an identical unit as determined and directed by the RE/COTR. Such replacement shall be at no additional cost to the Government.
3. Interiors of new equipment and piping systems shall be protected against entry of foreign matter. Both inside and outside shall be cleaned before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

##### **B. Cleanliness of Piping and Equipment Systems:**

1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading and welding of piping shall be removed.
2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
3. The interior of all tanks shall be cleaned prior to delivery and beneficial use by the Government. All piping shall be tested in accordance with the specifications and the International Plumbing Code (IPC), latest edition. All filters, strainers, fixture faucets shall be flushed of debris prior to final acceptance.
4. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

## 1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below shall 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):  
Boiler and Pressure Vessel Code (BPVC):  
SEC IX-2007.....Boiler and Pressure Vessel Code; Section IX,  
Welding and Brazing Qualifications.
- C. American Society for Testing and Materials (ASTM):  
A36/A36M-2008.....Standard Specification for Carbon Structural  
Steel  
A575-96 (R 2007).....Standard Specification for Steel Bars, Carbon,  
Merchant Quality, M-Grades R (2002)  
E84-2005.....Standard Test Method for Surface Burning  
Characteristics of Building Materials  
E119-2008a.....Standard Test Methods for Fire Tests of  
Building Construction and Materials
- D. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc:  
SP-58-02.....Pipe Hangers and Supports-Materials, Design and  
Manufacture  
SP 69-2003 (R 2004).....Pipe Hangers and Supports-Selection and  
Application
- E. National Electrical Manufacturers Association (NEMA):  
MG1-2003, Rev. 1-2007...Motors and Generators
- D. International Code Council, (ICC):  
IBC-06, (R 2007).....International Building Code  
IPC-06, (R 2007).....International Plumbing Code

## PART 2 - PRODUCTS

### 2.1 FACTORY-ASSEMBLED PRODUCTS

- A. STANDARDIZATION OF COMPONENTS SHALL BE MAXIMIZED TO REDUCE SPARE PART requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
  - 1. All components of an assembled unit need not be products of same manufacturer.
  - 2. Constituent parts that are alike shall be products of a single manufacturer.

3. Components shall be compatible with each other and with the total assembly for intended service.
4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, shall be the same make and model

## **2.2 COMPATIBILITY OF RELATED EQUIPMENT**

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

## **2.3 SAFETY GUARDS**

- A. Pump shafts and couplings shall be fully guarded by a sheet steel guard, covering coupling and shaft but not bearings. Material shall be minimum 16-gage sheet steel; ends shall be braked and drilled and attached to pump base with minimum of four 6 mm (1/4-inch) bolts. Reinforce guard as necessary to prevent side play forcing guard onto couplings.
- B. All Equipment shall have moving parts protected from personal injury.

## **2.4 LIFTING ATTACHMENTS**

Equipment shall be provided with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

## **2.5 ELECTRIC MOTORS, MOTOR CONTROL, CONTROL WIRING**

- A. All material and equipment furnished and installation methods shall conform to the requirements of Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT; Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS; and, Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW). All electrical wiring, conduit, and devices necessary for the proper connection, protection and operation of the systems shall be provided. Premium efficient

motors shall be provided. Unless otherwise specified for a particular application, electric motors shall have the following requirements.

B. Special Requirements:

1. Where motor power requirements of equipment furnished deviate from power shown on plans, provide electrical service designed under the requirements of NFPA 70 without additional time or cost to the Government.
2. Assemblies of motors, starters, and controls and interlocks on factory assembled and wired devices shall be in accordance with the requirements of this specification.
3. Wire and cable materials specified in the electrical division of the specifications shall be modified as follows:
  - a. Wiring material located where temperatures can exceed 71° C (160° F) shall be stranded copper with Teflon FEP insulation with jacket. This includes wiring on the boilers.
  - b. Other wiring at boilers and to control panels shall be NFPA 70 designation THWN.
  - c. Shielded conductors or wiring in separate conduits for all instrumentation and control systems shall be provided where recommended by manufacturer of equipment.
4. Motor sizes shall be selected so that the motors do not operate into the service factor at maximum required loads on the driven equipment. Motors on pumps shall be sized for non-overloading at all points on the pump performance curves.
5. Motors utilized with variable frequency drives shall be rated "inverter-ready" per NEMA Standard, MG1, Part 31.4.4.2.

C. Motor Efficiency and Power Factor: All motors, when specified as "high efficiency or Premium Efficiency" by the project specifications on driven equipment, shall conform to efficiency and power factor requirements in Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT, with no consideration of annual service hours. Motor manufacturers generally define these efficiency requirements as "NEMA premium efficient" and the requirements generally exceed those of the Energy Policy Act of 1992 (EPACT). Motors not specified as "high efficiency or premium efficient" shall comply with EPACT.

D. Single-phase Motors: Capacitor-start type for hard starting applications. Motors for centrifugal fans and pumps may be split phase or permanent split capacitor (PSC).

- E. Poly-phase Motors: NEMA Design B, Squirrel cage, induction type. Each two-speed motor shall have two separate windings. A time delay (20 seconds minimum) relay shall be provided for switching from high to low speed.
- F. Rating: Rating shall be continuous duty at 100 percent capacity in an ambient temperature of 40° C (104° F); minimum horsepower as shown on drawings; maximum horsepower in normal operation shall not exceed nameplate rating without service factor.
- G. Insulation Resistance: Not less than one-half meg-ohm between stator conductors and frame shall be measured at the time of final inspection.

## **2.7 EQUIPMENT AND MATERIALS IDENTIFICATION**

- A. Use symbols, nomenclature and equipment numbers specified, shown on the drawings, or shown in the maintenance manuals. In addition, provide bar code identification nameplate for all equipment which will allow the equipment identification code to be scanned into the system for maintenance and inventory tracking. Identification for piping is specified in Section 09 91 00, PAINTING.
- B. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 48 mm (3/16-inch) high of brass with black-filled letters, or rigid black plastic with white letters specified in Section 09 91 00, PAINTING shall be permanently fastened to the equipment. Unit components such as water heaters, tanks, coils, filters, fans, etc. shall be identified.
- C. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 48 mm (3/16-inch) high riveted or bolted to the equipment.
- D. Control Items: All temperature, pressure, and controllers shall be labeled and the component's function identified. Identify and label each item as they appear on the control diagrams.
- E. Valve Tags and Lists:
  - 1. Plumbing: All valves shall be provided with valve tags and listed on a valve list (Fixture stops not included).
  - 2. Valve tags: Engraved black filled numbers and letters not less than 13 mm (1/2-inch) high for number designation, and not less than 6.4 mm (1/4-inch) for service designation on 19 gage, 38 mm (1-1/2 inches) round brass disc, attached with brass "S" hook or brass chain.

3. Valve lists: Valve lists shall be created using a word processing program and printed on plastic coated cards. The plastic coated valve list card(s), sized 216 mm (8-1/2 inches) by 280 mm (11 inches) shall show valve tag number, valve function and area of control for each service or system. The valve list shall be in a punched 3-ring binder notebook. A copy of the valve list shall be mounted in picture frames for mounting to a wall.
4. A detailed plan for each floor of the building indicating the location and valve number for each valve shall be provided. Each valve location shall be identified with a color coded sticker or thumb tack in ceiling.

## **2.8 FIRE STOPPING**

- A. Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION, for pipe insulation.

## **2.9 GALVANIZED REPAIR COMPOUND**

- A. Mil. Spec. DOD-P-21035B, paint.

## **2.10 PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS**

- A. In lieu of the paragraph which follows, suspended equipment support and restraints may be designed and installed in accordance with the International Building Code (IBC), latest edition. Submittals based on the International Building Code (IBC), latest edition, SECTION 13 05 41 requirements, or the following paragraphs of this Section shall be stamped and signed by a professional engineer registered in a state where the project is located. The Support system of suspended equipment over 227 kg (500 pounds) shall be submitted for approval of the Resident Engineer in all cases. See these specifications for lateral force design requirements.
- B. Type Numbers Specified: MSS SP-58. For selection and application refer to MSS SP-69. Refer to Section 05 50 00, METAL FABRICATIONS, for miscellaneous metal support materials and prime coat painting.
- C. For Attachment to Concrete Construction:
  1. Concrete insert: Type 18, MSS SP-58.
  2. Self-drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 102 mm (4 inches) thick when approved by the Resident Engineer for each job condition.

3. Power-driven fasteners: Permitted in existing concrete or masonry not less than 102 mm (4 inches) thick when approved by the Resident Engineer for each job condition.
- D. For Attachment to Steel Construction: MSS SP-58.
  1. Welded attachment: Type 22.
  2. Beam clamps: Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 23 mm (7/8-inch) outside diameter.
- E. Attachment to Metal Pan or Deck: As required for materials specified in Section 05 31 00, STEEL DECKING.
- F. For Attachment to Wood Construction: Wood screws or lag bolts.
- G. Hanger Rods: Hot-rolled steel, ASTM A36 or A575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn-buckles shall provide 38 mm (1-1/2 inches) minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.
- H. Multiple (Trapeze) Hangers: Galvanized, cold formed, lipped steel channel horizontal member, not less than 41 mm by 41 mm (1-5/8 inches by 1-5/8 inches), 2.7 mm (No. 12 gage), designed to accept special spring held, hardened steel nuts. Trapeze hangers are not permitted for steam supply and condensate piping.
  1. Allowable hanger load: Manufacturers rating less 91kg (200 pounds).
  2. Guide individual pipes on the horizontal member of every other trapeze hanger with 6 mm (1/4-inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 13 mm (1/2-inch) galvanized steel bands, or insulated calcium silicate shield for insulated piping at each hanger.
- I. Pipe Hangers and Supports: (MSS SP-58), use hangers sized to encircle insulation on insulated piping. Refer to Section 23 07 11, HVAC, PLUMBING, and BOILER PLANT INSULATION for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports or insulated calcium silicate shields. Provide Type 40 insulation shield or insulated calcium silicate shield at all other types of supports and hangers including those for insulated piping.
  1. General Types (MSS SP-58):
    - a. Standard clevis hanger: Type 1; provide locknut.
    - b. Riser clamps: Type 8.
    - c. Wall brackets: Types 31, 32 or 33.
    - d. Roller supports: Type 41, 43, 44 and 46.

- e. Saddle support: Type 36, 37 or 38.
  - f. Turnbuckle: Types 13 or 15.
  - g. U-bolt clamp: Type 24.
  - h. Copper Tube:
    - 1) Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, plastic coated or taped with isolation tape to prevent electrolysis.
    - 2) For vertical runs use epoxy painted or plastic coated riser clamps.
    - 3) For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
    - 4) Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.
  - i. Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp. //Spring Supports (Expansion and contraction of vertical piping):
    - 1) Movement up to 20 mm (3/4-inch): Type 51 or 52 variable spring unit with integral turn buckle and load indicator.
    - 2) Movement more than 20 mm (3/4-inch): Type 54 or 55 constant support unit with integral adjusting nut, turn buckle and travel position indicator. //
  - j. Spring hangers are required on all plumbing system pumps one horsepower and greater.
2. Plumbing Piping (Other Than General Types):
- a. Horizontal piping: Type 1, 5, 7, 9, and 10.
  - b. Chrome plated piping: Chrome plated supports.
  - c. Hangers and supports in pipe chase: Prefabricated system ABS self-extinguishing material, not subject to electrolytic action, to hold piping, prevent vibration and compensate for all static and operational conditions.
  - d. Blocking, stays and bracing: Angle iron or preformed metal channel shapes, 1.3 mm (18 gage) minimum.
- J. Pre-insulated Calcium Silicate Shields:



1. Provide 360 degree water resistant high density 965 kPa (140 psi) compressive strength calcium silicate shields encased in galvanized metal.
2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
3. Shield thickness shall match the pipe insulation.
4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
  - a. Shields for supporting cold water shall have insulation that extends a minimum of one inch past the sheet metal.
  - b. The insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS-SP 69. To support the load, the shields shall have one or more of the following features: structural inserts 4138 kPa (600 psi) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36) wear plates welded to the bottom sheet metal jacket.
5. Shields may be used on steel clevis hanger type supports, roller supports or flat surfaces.

## **2.11 PIPE PENETRATIONS**

- A. Pipe penetration sleeves shall be installed for all pipe other than rectangular blocked out floor openings for risers in mechanical bays.
- B. Pipe penetration sleeve materials shall comply with all fire stopping requirements for each penetration.
- C. To prevent accidental liquid spills from passing to a lower level, provide the following:
  1. For sleeves: Extend sleeve 25 mm (1 inch) above finished floor and provide sealant for watertight joint.
  2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
  3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.
- C. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from these requirements must receive prior approval of Resident Engineer.
- D. Sheet metal, plastic, or moisture resistant fiber sleeves shall be provided for pipe passing through floors, interior walls, and

partitions, unless brass or steel pipe sleeves are specifically called for below.

- E. Cast iron or zinc coated pipe sleeves shall be provided for pipe passing through exterior walls below grade. The space between the sleeve and pipe shall be made watertight with a modular or link rubber seal. The link seal shall be applied at both ends of the sleeve.
- F. Galvanized steel or an alternate black iron pipe with asphalt coating sleeves shall be for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. A galvanized steel Sleeve shall be provided for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, sleeves shall be connected with a floor plate.
- G. Brass Pipe Sleeves shall be provided for pipe passing through quarry tile, terrazzo or ceramic tile floors. The sleeve shall be connected with a floor plate.
- H. Sleeve clearance through floors, walls, partitions, and beam flanges shall be 25 mm (1 inch) greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation plus 25 mm (1 inch) in diameter. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.
- I. Sealant and Adhesives: Shall be as specified in Section 07 92 00, JOINT SEALANTS.

## **2.12 TOOLS AND LUBRICANTS**

- A. Furnish, and turn over to the Resident Engineer, special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.
- C. Tool Containers: metal, permanently identified for intended service and mounted, or located, where directed by the Resident Engineer.
- D. Lubricants: A minimum of 0.95 L (1 quart) of oil, and 0.45 kg (1 pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

## **2.13 WALL, FLOOR AND CEILING PLATES**

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening

to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.

- B. Thickness: Not less than 2.4 mm (3/32-inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025-inch) for up to 80 mm (3 inch) pipe, 0.89 mm (0.035-inch) for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Wall plates shall be used where insulation ends on exposed water supply pipe drop from overhead. A watertight joint shall be provided in spaces where brass or steel pipe sleeves are specified.

#### **2.14 ASBESTOS**

Materials containing asbestos are not permitted.

### **PART 3 - EXECUTION**

#### **3.1 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING**

- A. Location of piping, sleeves, inserts, hangers, and equipment, access provisions shall be coordinated with the work of all trades. Piping, sleeves, inserts, hangers, and equipment shall be located clear of windows, doors, openings, light outlets, and other services and utilities. Equipment layout drawings shall be prepared to coordinate proper location and personnel access of all facilities. The drawings shall be submitted for review.

Manufacturer's published recommendations shall be followed for installation methods not otherwise specified.

- B. Operating Personnel Access and Observation Provisions: All equipment and systems shall be arranged to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Maintenance and operating space and access provisions that are shown on the drawings shall not be changed nor reduced.
- C. Structural systems necessary for pipe and equipment support shall be coordinated to permit proper installation.
- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- E. Cutting Holes:

1. Holes through concrete and masonry shall be cut by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted by RE/COTR where working area space is limited.
  2. Holes shall be located to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by RE/COTR. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to RE/COTR for approval.
  3. Waterproof membrane shall not be penetrated. Pipe floor penetration block outs shall be provided outside the extents of the waterproof membrane.
- F. Interconnection of Instrumentation or Control Devices: Generally, electrical and pneumatic interconnections are not shown but must be provided.
- G. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- H. Protection and Cleaning:
1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Resident Engineer. Damaged or defective items in the opinion of the Resident Engineer, shall be replaced.
  2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Pipe openings, equipment, and plumbing fixtures shall be tightly covered against dirt or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- I. Concrete and Grout: Concrete and shrink compensating grout 25 MPa (3000 psi) minimum, specified in Section 03 30 00, CAST-IN-PLACE CONCRETE, shall be used for all pad or floor mounted equipment. Gages, thermometers, valves and other devices shall be installed with due regard for ease in reading or operating and maintaining said devices. Thermometers and gages shall be located and positioned to be easily read by operator or staff standing on floor or walkway provided.

Servicing shall not require dismantling adjacent equipment or pipe work.

- J. Interconnection of Controls and Instruments: Electrical interconnection is generally not shown but shall be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments and computer workstations. Comply with NFPA-70.
- K. Many plumbing systems interface with the HVAC control system. See the HVAC control points list and section 23 09 23 DIRECT DIGITAL CONTROLS FOR HVAC
- L. Work in Existing Building:
  - 1. Perform as specified in Article, OPERATIONS AND STORAGE AREAS, Article, ALTERATIONS, and Article, RESTORATION of the Section 01 00 00, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).
  - 2. As specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will cause the least interfere with normal operation of the facility.
- N. Work in bathrooms, restrooms, housekeeping closets: All pipe penetrations behind escutcheons shall be sealed with plumbers putty.
- O. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints.
- P. Inaccessible Equipment:
  - 1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Government.
  - 2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as electrical conduit, motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

### **3.2 TEMPORARY PIPING AND EQUIPMENT**

- A. Continuity of operation of existing facilities may require temporary installation or relocation of equipment and piping. Temporary

equipment or pipe installation or relocation shall be provided to maintain continuity of operation of existing facilities.

- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities. The requirements of Para. 3.1 shall apply.
- C. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Necessary blind flanges and caps shall be provided to seal open piping remaining in service.

### **3.3 RIGGING**

- A. Openings in building structures shall be planned to accommodate design scheme.
- B. Alternative methods of equipment delivery may be offered and will be considered by Government under specified restrictions of phasing and service requirements as well as structural integrity of the building.
- C. All openings in the building shall be closed when not required for rigging operations to maintain proper environment in the facility for Government operation and maintenance of service.
- D. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility.
- E. Contractor shall check all clearances, weight limitations and shall provide a rigging plan designed by a Registered Professional Engineer. All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.
- F. Rigging plan and methods shall be referred to RE/COTR for evaluation prior to actual work.

### **3.4 PIPE AND EQUIPMENT SUPPORTS**

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Holes shall be drilled or burned in structural steel ONLY with the prior written approval of the Resident Engineer.

- B. The use of chain pipe supports, wire or strap hangers; wood for blocking, stays and bracing, or hangers suspended from piping above shall not be permitted. Rusty products shall be replaced.
- C. Hanger rods shall be used that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. A minimum of 15 mm (1/2-inch) clearance between pipe or piping covering and adjacent work shall be provided.
- D. For horizontal and vertical plumbing pipe supports, refer to the International Plumbing Code (IPC), latest edition, and these specifications.
- E. Overhead Supports:
  - 1. The basic structural system of the building is designed to sustain the loads imposed by equipment and piping to be supported overhead.
  - 2. Provide steel structural members, in addition to those shown, of adequate capability to support the imposed loads, located in accordance with the final approved layout of equipment and piping.
  - 3. Tubing and capillary systems shall be supported in channel troughs.
- F. Floor Supports:
  - 1. Provide concrete bases, concrete anchor blocks and pedestals, and structural steel systems for support of equipment and piping. Concrete bases and structural systems shall be anchored and doweled to resist forces under operating and seismic conditions (if applicable) without excessive displacement or structural failure.
  - 2. Bases and supports shall not be located and installed until equipment mounted thereon has been approved. Bases shall be sized to match equipment mounted thereon plus 50 mm (2 inch) excess on all edges. Structural drawings shall be reviewed for additional requirements. Bases shall be neatly finished and smoothed, shall have chamfered edges at the top, and shall be suitable for painting.
  - 3. All equipment shall be shimmed, leveled, firmly anchored, and grouted with epoxy grout. Anchor bolts shall be placed in sleeves, anchored to the bases. Fill the annular space between sleeves and bolts with a grout material to permit alignment and realignment.

### 3.5 LUBRICATION

- A. All equipment and devices requiring lubrication shall be lubricated prior to initial operation. All devices and equipment shall be field checked for proper lubrication.

- B. All devices and equipment shall be equipped with required lubrication fittings. A minimum of one liter (one quart) of oil and 0.5 kg (one pound) of grease of manufacturer's recommended grade and type for each different application shall be provided. All materials shall be delivered to RE/COTR in unopened containers that are properly identified as to application.
- C. A separate grease gun with attachments for applicable fittings shall be provided for each type of grease applied.
- D. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.
- E. All lubrication points shall be extended to one side of the equipment.

### **3.6 PLUMBING SYSTEMS DEMOLITION**

- A. Rigging access, other than indicated on the drawings, shall be provided after approval for structural integrity by the RE/COTR. Such access shall be provided without additional cost or time to the Government. Where work is in an operating plant, approved protection from dust and debris shall be provided at all times for the safety of plant personnel and maintenance of plant operation and environment of the plant.
- B. In an operating plant, cleanliness and safety shall be maintained. The plant shall be kept in an operating condition. Government personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and plant operation. Work shall be confined to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Dust and debris shall not be permitted to accumulate in the area to the detriment of plant operation. All flame cutting shall be performed to maintain the fire safety integrity of this plant. Adequate fire extinguishing facilities shall be available at all times. All work shall be performed in accordance with recognized fire protection standards. Inspections will be made by personnel of the VA Medical Center, and the Contractor shall follow all directives of the RE or COTR with regard to rigging, safety, fire safety, and maintenance of operations.
- C. Unless specified otherwise, all piping, wiring, conduit, and other devices associated with the equipment not re-used in the new work shall be completely removed from Government property. This includes all concrete equipment pads, pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. All openings shall be sealed after removal of



equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.

- D. All valves including gate, globe, ball, butterfly and check, all pressure gages and thermometers with wells shall remain Government property and shall be removed and delivered to RE/COTR and stored as directed. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from Government property expeditiously and shall not be allowed to accumulate.
- E. Asbestos Insulation Removal: Conform to Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT.

### **3.7 CLEANING AND PAINTING**

- A. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Government, the plant facilities, equipment and systems shall be thoroughly cleaned and painted. Refer to Section 09 91 00, PAINTING.
- B. In addition, the following special conditions apply:
  - 1. Cleaning shall be thorough. Solvents, cleaning materials and methods recommended by the manufacturers shall be used for the specific tasks. All rust shall be removed prior to painting and from surfaces to remain unpainted. Scratches, scuffs, and abrasions shall be repaired prior to applying prime and finish coats.
  - 2. The following Material And Equipment shall NOT be painted::
    - a. Motors, controllers, control switches, and safety switches.
    - b. Control and interlock devices.
    - c. Regulators.
    - d. Pressure reducing valves.
    - e. Control valves and thermostatic elements.
    - f. Lubrication devices and grease fittings.
    - g. Copper, brass, aluminum, stainless steel and bronze surfaces.
    - h. Valve stems and rotating shafts.
    - i. Pressure gages and thermometers.
    - j. Glass.
    - k. Name plates.

3. Control and instrument panels shall be cleaned and damaged surfaces repaired. Touch-up painting shall be made with matching paint obtained from manufacturer or computer matched.
4. Pumps, motors, steel and cast iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same color as utilized by the pump manufacturer
5. Temporary Facilities: Apply paint to surfaces that do not have existing finish coats.
6. The final result shall be a smooth, even-colored, even-textured factory finish on all items. The entire piece of equipment shall be repainted, if necessary, to achieve this.

### **3.8 IDENTIFICATION SIGNS**

- A. Laminated plastic signs, with engraved lettering not less than 5 mm (3/16-inch) high, shall be provided that designates equipment function, for all equipment, switches, motor controllers, relays, meters, control devices, including automatic control valves. Nomenclature and identification symbols shall correspond to that used in maintenance manual, and in diagrams specified elsewhere. Attach by chain, adhesive, or screws.
- B. Factory Built Equipment: Metal plate, securely attached, with name and address of manufacturer, serial number, model number, size, performance shall be placed on factory built equipment.
- C. Pipe Identification: Refer to Section 09 91 00, PAINTING.

### **3.9 STARTUP AND TEMPORARY OPERATION**

- A. Start up of equipment shall be performed as described in the equipment specifications. Vibration within specified tolerance shall be verified prior to extended operation. Temporary use of equipment is specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.

### **3.10 OPERATING AND PERFORMANCE TESTS**

- A. Prior to the final inspection, all required tests shall be performed as specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TESTS and submit the test reports and records to the Resident Engineer.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Government.

- C. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests such systems respectively during first actual seasonal use of respective systems following completion of work.

### **3.11 OPERATION AND MAINTENANCE MANUALS**

- A. Provide four bound copies. The Operations and maintenance manuals shall be delivered to RE/COTR not less than 30 days prior to completion of a phase or final inspection.
- B. All new and temporary equipment and all elements of each assembly shall be included.
- C. Data sheet on each device listing model, size, capacity, pressure, speed, horsepower, impeller size, and other information shall be included.
- D. Manufacturer's installation, maintenance, repair, and operation instructions for each device shall be included. Assembly drawings and parts lists shall also be included. A summary of operating precautions and reasons for precautions shall be included in the Operations and Maintenance Manual.
- E. Lubrication instructions, type and quantity of lubricant shall be included.
- F. Schematic diagrams and wiring diagrams of all control systems corrected to include all field modifications shall be included.
- G. Set points of all interlock devices shall be listed.
- H. Trouble-shooting guide for the control system troubleshooting guide shall be inserted into the Operations and Maintenance Manual.
- I. The combustion control system sequence of operation corrected with submittal review comments shall be inserted into the Operations and Maintenance Manual.
- J. Emergency procedures.

### **3.12 INSTRUCTIONS TO VA PERSONNEL**

Instructions shall be provided in accordance with Article,  
INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.

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**SECTION 22 05 19**  
**METERS AND GAGES FOR PLUMBING PIPING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section describes the requirements for water meters and pressure gages.

**1.2 RELATED WORK**

Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Water Meter.
  - 2. Pressure Gages.
  - 3. BACnet communication protocol
  - 4. Product certificates for each type of meter and gauge
- C. Operations and Maintenance manual shall include:
  - 1. System Description
  - 2. Major assembly block diagrams
  - 3. Troubleshooting and preventive maintenance guidelines
  - 4. Spare parts information.
- D. Shop Drawings shall include the following:
  - 1. One line, wiring and terminal diagrams including terminals identified, protocol or communication modules, and Ethernet connections.

**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. American National Standards Institute (ANSI):
  - American Society of Mechanical Engineers (ASME): (Copyrighted Society)
  - B40.1-05.....Gauges-Pressure Indicating Dial Type-Elastic
- D. International Code Council (ICC):
  - IPC-06.....(2007 Supplement) International Plumbing Code

**1.5 AS-BUILT DOCUMENTATION**

- A. The electronic documentation and copies of the Operations and Maintenance Manual, approved submittals, shop drawings, and other

closeout documentation shall be prepared by a computer software program complying with Section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C 794d). The manufacturer or vendor of the software used to prepare the electronic documentation shall have a Voluntary Product Accessibility Template made available for review and included as part of the Operations and Maintenance Manual or closeout documentation. All available accessibility functions listed in the Voluntary Accessibility Template shall be enabled in the prepared electronic files. As Adobe Acrobat is a common industry format for such documentation, following the document, "Creating Accessible Adobe PDF files, A Guide for Document Authors" that is maintained and made available by Adobe free of charge is recommended."

- B. Four sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- C. Four sets of operation and maintenance data updated to include submittal review comments shall be inserted into a three ring binder. All aspects of system operation and maintenance procedures, including piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices such as damper and door closure interlocks shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.

## **PART 2 - PRODUCTS**

### **2.7 PRESSURE GAGES FOR WATER AND SEWAGE USAGE**

- A. ANSI B40.1 all metal case 114 mm (4-1/2 inches) diameter, bottom connected throughout, graduated as required for service, and identity labeled. Range shall be 0 to 1375 kPa (0 to 200 psi) gauge.
- B. The pressure element assembly shall be bourdon tube. The mechanical movement shall be lined to pressure element and connected to pointer.
- C. The dial shall be non-reflective aluminum with permanently etched scale markings graduated in kPa and psi.
- D. The pointer shall be dark colored metal.
- E. The window shall be glass.

- F. The ring shall be brass or stainless steel.
- G. The accuracy shall be grade A, plus or minus 1 percent of middle half of scale range.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Direct mounted pressure gages shall be installed in piping tees with pressure gage located on pipe at the most readable position.
- B. Valves and snubbers shall be installed in piping for each pressure gage.
- C. Test plugs shall be installed on the inlet and outlet pipes all heat exchangers or water heaters serving more than one plumbing fixture.
- D. Pressure gages shall be installed where indicated on the drawings and at the following locations:
  - 1. Building water service entrance into building
  - 2. Inlet and outlet of each pressure reducing valve
  - 3. Suction and discharge of each domestic water pump or re-circulating hot water return pump.

#### **3.2 FIELD QUALITY CONTROL**

- A. The meter assembly shall be visually inspected and operationally tested. The correct multiplier placement on the face of the meter shall be verified.

#### **3.3 TRAINING**

- A. A training course shall be provided to the medical center on meter configuration and maintenance. Training manuals shall be supplied for all attendee with four additional copies supplied. The training course shall cover meter configuration, troubleshooting, and diagnostic procedures.

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**SECTION 22 05 23**  
**GENERAL-DUTY VALVES FOR PLUMBING PIPING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section describes the requirements for general-duty valves for domestic water and sewer systems.

**1.2 RELATED WORK**

- A. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Manufacturer's Literature and Data:
1. Valves.
  2. Backflow Preventers.
  3. Pressure Reducing Valves.
  4. Backwater Valves
  5. All items listed in Part 2 - Products.

**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. American Society for Testing and Materials (ASTM): A536-84 (R 2004)  
Standard Specification for Ductile Iron Castings
- C. American Society of Sanitary Engineering (ASSE)  
ASSE 1003-01 (R 2003)...Performance Requirements for Water Pressure Reducing Valves  
ASSE 1012-02.....Backflow Preventer with Intermediate Atmospheric Vent  
ASSE 1013-05.....Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers
- D. International Code Council (ICC)  
IPC-06 (R 2007).....International Plumbing Code
- E. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS):  
SP-25-98.....Standard Marking System for Valves, Fittings, Flanges and Unions  
SP-67-02a (R 2004) Butterfly Valve of the Single flange Type (Lug Wafer)

SP-70-06.....Cast Iron Gate Valves, Flanged and Threaded  
Ends.

SP-72-99.....Ball Valves With Flanged or Butt Welding For  
General Purpose

SP-80-03.....Bronze Gate, Globe, Angle and Check Valves.

SP-110-96.....Ball Valve Threaded, Socket Welding, Solder  
Joint, Grooved and Flared Ends

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Valves shall be prepared for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces
  - 5. Set butterfly valves closed or slightly open.
  - 6. Block check valves in either closed or open position.
- B. Valves shall be prepared for storage as follows:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew point temperature.
- C. A sling shall be used for large valves. The sling shall be rigged to avoid damage to exposed parts. Hand wheels or stems shall not be used as lifting or rigging points.

## **PART 2 - PRODUCTS**

### **2.1 VALVES**

- A. Asbestos packing and gaskets are prohibited.
- B. Bronze valves shall be made with dezincification resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc shall not be permitted.
- C. Valves in insulated piping shall have 50 mm or DN50 (2 inch) stem extensions and extended handles of non-thermal conductive material that allows operating the valve without breaking the vapor seal or disturbing the insulation. Memory stops shall be fully adjustable after insulation is applied.
- D. Exposed Valves over 65 mm or DN65 (2-1/2 inches) installed at an elevation over 3.6 meters (12 feet) shall have a chain-wheel attachment to valve hand-wheel, stem, or other actuator.



E. Ball valves, pressure regulating valves, gate valves, globe valves, and plug valves used to supply potable water shall meet the requirements of NSF 61.

F. Shut-off:

1. Cold, Hot and Re-circulating Hot Water:

- a. 50 mm or DN50 (2 inches) and smaller: Ball, MSS SP-72, SP-110, Ball valve shall be full port three piece or two piece with a union design with adjustable stem package. Threaded stem designs are not allowed. The ball valve shall have a SWP rating of 1035 kPa (150 psig) and a CWP rating of 4140 kPa (600 psig). The body material shall be Bronze ASTM B584, Alloy C844. The ends shall be solder,
- b. Less than 100 mm DN100 (4 inches): Butterfly shall have an iron body with EPDM seal and aluminum bronze disc. The butterfly valve shall meet MSS SP-67, type I standard. The butterfly valve shall have a SWP rating of 1380 kPa (200 psig). The valve design shall be lug type suitable for bidirectional dead-end service at rated pressure. The body material shall meet ASTM A 536, ductile iron.

C. Balancing:

1. Hot Water Re-circulating, 80 mm or DN80 (3 inches) and smaller manual balancing valve shall be of bronze body, brass ball construction with glass and carbon filled TFE seat rings and designed for positive shutoff. The manual balancing valve shall have differential pressure read-out ports across the valve seat area. The read out ports shall be fitting with internal EPT inserts and check valves. The valve body shall have 8 mm or DN8 NPT (¼" NPT) tapped drain and purge port. The valves shall have memory stops that allow the valve to close for service and then reopened to set point without disturbing the balance position. All valves shall have calibrated nameplates to assure specific valve settings.

D. Check:

1. Check valves less than 80 mm or DN80 (3 inches) and smaller) shall be class 125, bronze swing check valves with non metallic Buna-N disc. The check valve shall meet MSS SP-80 Type 4 standard. The check valve shall have a CWP rating of 1380 kPa (200 psig). The check valve shall have a Y pattern horizontal body design with

bronze body material conforming to ASTM B 62, solder joints, and PTFE or TFE disc.

E. Globe:

1. 80 mm or DN80 (3 inches) or smaller: Class 150, bronze globe valve with non metallic disc. The globe valve shall meet MSS SP-80, Type 2 standard. The globe valve shall have a CWP rating of 2070 kPa (300 psig). The valve material shall be bronze with integral seal and union ring bonnet conforming to ASTM B 62 with solder ends, copper-silicon bronze stem, TPTFE or TFE disc, malleable iron hand wheel.

## 2.4 BACKFLOW PREVENTERS

- A. A backflow prevention assembly shall be installed at any point in the plumbing system where the potable water supply comes in contact with a potential source of contamination. The backflow prevention assembly shall be ASSE 1013 listed and certified.
- B. Reduced pressure backflow preventers shall be installed in the following applications.
  5. Water make up to heating systems, cooling tower, chilled water system, generators, and similar equipment consuming water.
  6. Water service entrance from loop system.
  7. Dental Equipment
  8. Humidifiers
  9. Atmospheric Vacuum Breaker: ASSE 1001
    - a. Hose bibs and sinks w/threaded outlets.
    - b. Disposers.
    - c. Showers (telephone type).
    - f. All kitchen equipment, if not protected by air gap.
    - g. Ventilating hoods with wash down system.
    - j. Dental equipment
- C. The reduced pressure principle backflow prevention assembly shall be ASSE listed 1013 with full port OS&Y gate valves and an integral relief monitor switch. The main body and access cover shall be epoxy coated duct iron conforming to ASTM A536 grade 4. The seat ring and check valve shall be Noryl (NSF listed). The stem shall be stainless steel conforming to ASTM A276. The seat disc elastomer shall be EPDM. The checks and the relief valve shall be accessible for maintenance without removing the device from the line. An epoxy coated wye type strainer with flanged connections shall be installed on the inlet.

- D. The atmospheric vacuum breaker shall be ASSE listed 1001. The main body shall be either cast bronze. All internal polymers shall be NSF listed. The seat disc elastomer shall be silicone. The device shall be accessible for maintenance without removing the device from the service line. The installation shall not be in a concealed or inaccessible location or where the venting of water from the device during normal operation is deemed objectionable.
- E. The double check detector backflow prevention assembly shall be ASSE listed 1048 and supply with full port OS&Y gate valves. The main body and access cover shall be epoxy coated ductile iron conforming to ASTM A536 grade. The seat ring and check valve shall be Noryl (NSF listed). The stem shall be stainless steel conforming to ASTM A 276. The seat disc elastomers shall be EPDM. The first and second check valve shall be accessible for maintenance without removing the device from the line.

## **2.5 CHAINWHEELS**

- A. Valve chain wheel assembly with sprocket rim brackets and chain shall be constructed according to the following:
  - 1. Brackets: type, number, size, and fasteners required to mount actuator on valve.
  - 2. Attachment: For connection to butterfly valve stem.
  - 3. Sprocket rim with chain guides: ductile or cast iron of type and size required for valve with zinc coating.
  - 4. Chain: hot dipped galvanized steel of size required to fit sprocket rim.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Valve interior shall be examined for cleanliness, freedom from foreign matter, and corrosion. Special packing materials shall be removed, such as blocks, used to prevent disc movement during shipping and handling.
- B. Valves shall be operated in positions from fully open to fully closed. Guides and seats shall be examined and made accessible by such operations.
- C. Threads on valve and mating pipe shall be examined for form and cleanliness.
- D. Mating flange faces shall be examined for conditions that might cause leakage. Bolting shall be checked for proper size, length, and

material. Gaskets shall be verified for proper size and that its material composition is suitable for service and free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

### **3.2 VALVE INSTALLATION**

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Valves shall be located for easy access and shall be provide with separate support. Valves shall be accessible with access doors when installed inside partitions or above hard ceilings.
- C. Valves shall be installed in horizontal piping with stem at or above center of pipe
- D. Valves shall be installed in a position to allow full stem movement.
- E. Install chain wheels on operators for butterfly, gate, and globe valves NPS 100 mm or DN100 (4 inches) and larger and more than [2400 mm (12 feet) above floor. Chains shall be extended to 1500 mm 3600 mm (60 inches) above finished floor.
- F. Check valves shall be installed for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.

### **3.3 ADJUSTING**

- A. Valve packing shall be adjusted or replaced after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves shall be replaced if persistent leaking occurs.

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**SECTION 22 07 11  
PLUMBING INSULATION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Field applied insulation for thermal efficiency and condensation control for
  - 1. Plumbing piping and equipment.
  - 2. Re-insulation of plumbing piping and equipment after asbestos abatement.
- B. Definitions
  - 1. ASJ: All service jacket, white finish facing or jacket.
  - 2. Air conditioned space: Space having air temperature and/or humidity controlled by mechanical equipment.
  - 3. Cold: Equipment or piping handling media at design temperature of 16 degrees C (60 degrees F) or below.
  - 4. Concealed: Piping above ceilings and in chases, interstitial space, and pipe spaces.
  - 5. Exposed: Piping and equipment exposed to view in finished areas including mechanical equipment rooms or exposed to outdoor weather. Shafts, chases, interstitial spaces, crawl spaces and pipe basements are not considered finished areas.
  - 6. FSK: Foil-scrim-kraft facing.
  - 7. Hot: Plumbing equipment or piping handling media above 41 degrees C (105 degrees F).
  - 8. Density:  $\text{kg/m}^3$  - kilograms per cubic meter (Pcf - pounds per cubic foot).
  - 9. Thermal conductance: Heat flow rate through materials.
    - a. Flat surface: Watts per square meter (BTU per hour per square foot).
    - b. Pipe or Cylinder: Watts per square meter (BTU per hour per linear foot).
  - 10. Thermal Conductivity (k): Watt per meter, per degree C (BTU per inch thickness, per hour, per square foot, per degree F temperature difference).
  - 11. Vapor Retarder (Vapor Barrier): A material which retards the transmission (migration) of water vapor. Performance of the vapor retarder is rated in terms of permeance (perms). For the purpose of this specification, vapor retarders shall have a maximum published

permeance of 0.1 perms and vapor barriers shall have a maximum published permeance of 0.001 perms.

- 12. R: Pump recirculation.
- 13. CW: Cold water.
- 14. SW: Soft water.
- 15. HW: Hot water.
- 16. PVDC: Polyvinylidene chloride vapor retarder jacketing, white.

## 1.2 RELATED WORK

- B. Section 02 82 13.13, GLOVEBAG ASBESTOS ABATEMENT: Insulation containing asbestos material.
- C. Section 07 84 00, FIRESTOPPING: Mineral fiber and bond breaker behind sealant.
- E. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING: General mechanical requirements and items, which are common to more than one section of Division 22.
- F. Section 22 05 19, METERS AND GAGES FOR PLUMBING PIPING and Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING: Hot and cold water piping.
- H. Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS. Requirements for commissioning, systems readiness checklists, and training.

## 1.3 QUALITY ASSURANCE

- A. Refer to article QUALITY ASSURANCE, in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

- B. Criteria:

- 1. Comply with NFPA 90A, particularly paragraphs 4.3.3.1 through 4.3.3.6, 4.3.10.2.6, and 5.4.6.4, parts of which are quoted as follows:

**4.3.3.1** Pipe insulation and coverings, vapor retarder facings, adhesives, fasteners, tapes, unless otherwise provided for in 4.3.3.1.12 or 4.3.3.1.2, shall have, in the form in which they are used, a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50 when tested in accordance with NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.

**4.3.3.1.1** Where these products are to be applied with adhesives, they shall be tested with such adhesives applied, or the adhesives used shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when in the final dry state. (See 4.2.4.2.)

**4.3.3.3** Pipe insulation and coverings shall not flame, glow, smolder, or smoke when tested in accordance with a similar test

for pipe covering, ASTM C 411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation, at the temperature to which they are exposed in service.

4.3.3.3.1 In no case shall the test temperature be below 121°C (250°F).

4.3.10.2.6.3 Nonferrous fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, Standard for Safety Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics.

4.3.10.2.6.7 Smoke detectors shall not be required to meet the provisions of this section.

2. Test methods: ASTM E84, UL 723, or NFPA 255.

3. Specified k factors are at 24 degrees C (75 degrees F) mean temperature unless stated otherwise. Where optional thermal insulation material is used, select thickness to provide thermal conductance no greater than that for the specified material. For pipe, use insulation manufacturer's published heat flow tables. For domestic hot water supply and return, run out insulation and condensation control insulation, no thickness adjustment need be made.

4. All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.

C. Every package or standard container of insulation or accessories delivered to the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material.

#### **1.4 SUBMITTALS**

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

B. Shop Drawings:

1. All information, clearly presented, shall be included to determine compliance with drawings and specifications and ASTM, federal and military specifications.

a. Insulation materials: Specify each type used and state surface burning characteristics.

b. Insulation facings and jackets: Each type used.

c. Insulation accessory materials: Each type used.

- d. Manufacturer's installation and fitting fabrication instructions for flexible unicellular insulation.
- e. Make reference to applicable specification paragraph numbers for coordination.

#### 1.5 STORAGE AND HANDLING OF MATERIAL

Store materials in clean and dry environment, pipe covering jackets shall be clean and unmarred. Place adhesives in original containers. Maintain ambient temperatures and conditions as required by printed instructions of manufacturers of adhesives, mastics and finishing cements.

#### 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 basic designation only.
- B. Federal Specifications (Fed. Spec.):  
L-P-535E (2)-91.....Plastic Sheet (Sheeting): Plastic Strip; Poly (Vinyl Chloride) and Poly (Vinyl Chloride - Vinyl Acetate), Rigid.
- C. Military Specifications (Mil. Spec.):  
MIL-A-3316C (2)-90.....Adhesives, Fire-Resistant, Thermal Insulation  
MIL-A-24179A (1)-87.....Adhesive, Flexible Unicellular-Plastic Thermal Insulation  
MIL-C-19565C (1)-88.....Coating Compounds, Thermal Insulation, Fire-and Water-Resistant, Vapor-Barrier  
MIL-C-20079H-87.....Cloth, Glass; Tape, Textile Glass; and Thread, Glass and Wire-Reinforced Glass
- D. American Society for Testing and Materials (ASTM):  
A167-04 .....Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip  
B209-07.....Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate  
C411-05.....Standard test method for Hot-Surface Performance of High-Temperature Thermal Insulation  
C449-07.....Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement



- C533-09.....Standard Specification for Calcium Silicate  
Block and Pipe Thermal Insulation
- C534-08 .....Standard Specification for Preformed Flexible  
Elastomeric Cellular Thermal Insulation in  
Sheet and Tubular Form
- C547-07 .....Standard Specification for Mineral Fiber pipe  
Insulation
- C553-08 .....Standard Specification for Mineral Fiber  
Blanket Thermal Insulation for Commercial and  
Industrial Applications
- C585-09.....Standard Practice for Inner and Outer Diameters  
of Rigid Thermal Insulation for Nominal Sizes  
of Pipe and Tubing (NPS System) R (1998)
- C612-10 .....Standard Specification for Mineral Fiber Block  
and Board Thermal Insulation
- C1136-10 .....Standard Specification for Flexible, Low  
Permeance Vapor Retarders for Thermal  
Insulation
- D1668-97a (2006).....Standard Specification for Glass Fabrics (Woven  
and Treated) for Roofing and Waterproofing
- E84-10 .....Standard Test Method for Surface Burning  
Characteristics of Building  
Materials
- E119-09C.....Standard Test Method for Fire Tests of Building  
Construction and Materials
- E136-09 b.....Standard Test Methods for Behavior of Materials  
in a Vertical Tube Furnace at 750 degrees C  
(1380 F)
- E. National Fire Protection Association (NFPA):
- 101-09 .....Life Safety Code
- 251-06.....Standard methods of Tests of Fire Endurance of  
Building Construction Materials
- 255-06.....Standard Method of tests of Surface Burning  
Characteristics of Building Materials

F. Underwriters Laboratories, Inc (UL):

723.....UL Standard for Safety Test for Surface Burning  
 Characteristics of Building Materials with  
 Revision of 08/03

G. Manufacturer's Standardization Society of the Valve and Fitting  
 Industry (MSS):

SP58-2002.....Pipe Hangers and Supports Materials, Design,  
 and Manufacture

## **PART 2 - PRODUCTS**

### **2.1 MINERAL FIBER OR FIBER GLASS**

- A. ASTM C612 (Board, Block), Class 1 or 2, density 48 kg/m<sup>3</sup> (3 pcf), k = 0.037 (.26) at 24 degrees C (75 degrees F), external insulation for temperatures up to 204 degrees C (400 degrees F).
- B. ASTM C553 (Blanket, Flexible) Type I, Class B-5, Density 32 kg/m<sup>3</sup> (2 pcf), k = 0.04 (0.27) at 24 degrees C (75 degrees F), for use at temperatures up to 204 degrees C (400 degrees F)
- C. ASTM C547 (Pipe Fitting Insulation and Preformed Pipe Insulation), Class 1, k = 0.037 (0.26) at 24 degrees C (75 degrees F), for use at temperatures up to 230 degrees C (450 degrees F) with an all service vapor retarder jacket with polyvinyl chloride premolded fitting covering.

### **2.2 Mineral wool or refractory fiber**

- A. Comply with Standard ASTM C612, Class 3, 450 degrees C (850 degrees F).

### **2.6 FLEXIBLE ELASTOMERIC CELLULAR THERMAL**

ASTM C177, C518, k = 0.039 (0.27) at 24 degrees C (75 degrees F), flame spread not over 25, smoke developed not over 50, for temperatures from minus 4 degrees C (40 degrees F) to 93 degrees C (200 degrees F). No jacket required.

### **2.7 CALCIUM SILICATE**

- A. Preformed pipe Insulation: ASTM C533, Type I and Type II with indicator denoting asbestos-free material.
- B. Premolded Pipe Fitting Insulation: ASTM C533, Type I and Type II with indicator denoting asbestos-free material.
- C. Equipment Insulation: ASTM C533, Type I and Type II
- D. Characteristics:

<b>Insulation Characteristics</b>
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ITEMS	TYPE I	TYPE II
Temperature, maximum degrees C (degrees F)	649 (1200)	927 (1700)
Density (dry), Kg/m <sup>3</sup> (lb/ ft <sup>3</sup> )	232 (14.5)	288 (18)
Thermal conductivity: Min W/ m K (Btu in/h ft <sup>2</sup> degrees F)@ mean temperature of 93 degrees C (200 degrees F)	0.059 (0.41)	0.078 (0.540)
Surface burning characteristics: Flame spread Index, Maximum	0	0
Smoke Density index, Maximum	0	0

## 2.8 INSULATION FACINGS AND JACKETS

- A. Vapor Retarder, higher strength with low water permeance  $\leq 0.02$  or less perm rating, Beach puncture 50 units for insulation facing on pipe insulation jackets. Facings and jackets shall be all service type (ASJ) jacketing.
- B. ASJ jacket shall be white kraft bonded to 0.025 mm (1 mil) thick aluminum foil, fiberglass reinforced, with pressure sensitive adhesive closure. Comply with ASTM C1136. Beach puncture 50 units, Suitable for painting without sizing. Jackets shall have minimum 40 mm (1-1/2 inch) lap on longitudinal joints and minimum 75mm (3 inch) butt strip on end joints. Butt strip material shall be same as the jacket. Lap and butt strips shall be self-sealing type with factory-applied pressure sensitive adhesive.
- C. Vapor Retarder medium strength with low water vapor permeance of 0.02 or less perm rating), Beach puncture 25 units: Foil-Scrim-Kraft (FSK) or PVDC vapor retarder jacketing type for concealed ductwork and equipment.
- D. Field applied vapor barrier jackets shall be provided, in addition to the specified facings and jackets, on all exterior piping as well as on interior piping exposed to outdoor air (i.e.; in ventilated attics, piping in ventilated (not air conditioned) spaces, etc.) in high humidity areas conveying fluids below ambient temperature. The vapor barrier jacket shall consist of a multi-layer laminated cladding with a maximum water vapor permeance of 0.001 perms. The minimum puncture resistance shall be 35 cm-kg (30 inch-pounds) for interior locations

and 92 cm-kg (80 inch-pounds) for exterior or exposed locations or where the insulation is subject to damage.

- E. Glass Cloth Jackets: Presized, minimum 0.18 kg per square meter (7.8 ounces per square yard), 2000 kPa (300 psig) bursting strength with integral vapor retarder where required or specified. Weather proof if utilized for outside service.
- F. Factory composite materials may be used provided
- G. Pipe fitting insulation covering (jackets): Fitting covering shall be premolded to match shape of fitting and shall be polyvinyl chloride (PVC) conforming to Fed Spec L-P-335, composition A, Type II Grade GU, and Type III, minimum thickness 0.7 mm (0.03 inches). Provide color matching vapor retarder pressure sensitive tape.
- H. Aluminum Jacket-Piping systems and circular breeching and stacks: ASTM B209, 3003 alloy, H-14 temper, 0.6 mm (0.023 inch) minimum thickness with locking longitudinal joints. Jackets for elbows, tees and other fittings shall be factory-fabricated to match shape of fitting and of 0.6 mm (0.024) inch minimum thickness aluminum. Fittings shall be of same construction as straight run jackets but need not be of the same alloy. Factory-fabricated stainless steel bands shall be installed on all circumferential joints. Bands shall be 13 mm (0.5 inch) wide on 450 mm (18 inch) centers. System shall be weatherproof if utilized for outside service.

## 2.9 PIPE COVERING PROTECTION SADDLES

- A. Cold pipe support: Premolded pipe insulation 180 degrees (half-shells) on bottom half of pipe at supports. Material shall be cellular glass insulation of the same thickness as adjacent insulation.

Nominal Pipe Size and Accessories Material (Insert Blocks)	
Nominal Pipe Size mm (inches)	Insert Blocks mm (inches)
Up through 125 (5)	150 (6) long
150 (6)	150 (6) long
200 (8), 250 (10), 300 (12)	225 (9) long
350 (14), 400 (16)	300 (12) long
450 through 600 (18 through 24)	350 (14) long

- B. Warm or hot pipe supports: Premolded pipe insulation (180 degree half-shells) on bottom half of pipe at supports. Material shall be high

density, cellular glass or calcium silicate. Insulation at supports shall have same thickness as adjacent insulation. Density of

## **2.10 ADHESIVE, MASTIC, CEMENT**

- A. Mil. Spec. MIL-A-3316, Class 1: Jacket and lap adhesive and protective finish coating for insulation.
- B. Mil. Spec. MIL-A-3316, Class 2: Adhesive for laps and for adhering insulation to metal surfaces.
- C. Mil. Spec. MIL-A-24179, Type II Class 1: Adhesive for installing flexible unicellular insulation and for laps and general use.
- D. Mil. Spec. MIL-C-19565, Type I: Protective finish for outdoor use.
- E. Mil. Spec. MIL-C-19565, Type I or Type II: Vapor barrier compound for indoor use.
- F. ASTM C449: Mineral fiber hydraulic-setting thermal insulating and finishing cement.
- G. Other: Insulation manufacturers' published recommendations.

## **2.11 MECHANICAL FASTENERS**

- A. Pins, anchors: Welded pins, or metal or nylon anchors with galvanized steel or fiber washer, or clips. Pin diameter shall be as recommended by the insulation manufacturer.
- B. Staples: Outward clinching galvanized steel
- C. Wire: 1.3 mm thick (18 gage) soft annealed galvanized or 1.9 mm (14 gage) copper clad steel or nickel copper alloy.
- D. Bands: 13 mm (1/2 inch) nominal width, brass, galvanized steel, aluminum or stainless steel.

## **2.12 REINFORCEMENT AND FINISHES**

- A. Glass fabric, open weave: ASTM D1668, Type III (resin treated) and Type I (asphalt treated).
- B. Glass fiber fitting tape: Mil. Spec MIL-C-20079, Type II, Class 1.
- C. Tape for Flexible Elastomeric Cellular Insulation: As recommended by the insulation manufacturer.
- D. Hexagonal wire netting: 25 mm (one inch) mesh, 0.85 mm thick (22 gage) galvanized steel.
- E. Corner beads: 50 mm (2 inch) by 50 mm (2 inch), 0.55 mm thick (26 gage) galvanized steel; or, 25 mm (1 inch) by 25 mm (1 inch), 0.47 mm thick (28 gage) aluminum angle adhered to 50 mm (2 inch) by 50 mm (2 inch) Kraft paper.
- F. PVC fitting cover: Fed. Spec L-P-535, Composition A, 11-86 Type II, Grade GU, with Form B Mineral Fiber insert, for media temperature 4

degrees C (40 degrees F) to 121 degrees C (250 degrees F). Below 4 degrees C (40 degrees F) and above 121 degrees C (250 degrees F). Provide double layer insert. Provide color matching vapor barrier pressure sensitive tape.

### **2.13 FIRESTOPPING MATERIAL**

Other than pipe insulation, refer to Section 07 84 00 FIRESTOPPING.

### **2.14 FLAME AND SMOKE**

Unless shown otherwise all assembled systems shall meet flame spread 25 and smoke developed 50 rating as developed under ASTM, NFPA and UL standards and specifications. See paragraph 1.3 "Quality Assurance".

## **PART 3 - EXECUTION**

### **3.1 GENERAL REQUIREMENTS**

- A. Required pressure tests of piping joints and connections shall be completed and the work approved by the Resident Engineer for application of insulation. Surface shall be clean and dry with all foreign materials, such as dirt, oil, loose scale and rust removed.
- B. Except for specific exceptions, insulate all specified equipment, and piping (pipe, fittings, valves, accessories). Insulate each pipe individually. Do not use scrap pieces of insulation where a full length section will fit.
- C. Where removal of insulation of piping and equipment is required to comply with Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT and Section 02 82 13.13, GLOVEBAG ASBESTOS ABATEMENT, such areas shall be reinsulated to comply with this specification.
- D. Insulation materials shall be installed in a first class manner with smooth and even surfaces, with jackets and facings drawn tight and smoothly cemented down at all laps. Insulation shall be continuous through all sleeves and openings, except at fire dampers and duct heaters (NFPA 90A). Vapor retarders shall be continuous and uninterrupted throughout systems with operating temperature 16 degrees C (60 degrees F) and below. Lap and seal vapor barrier over ends and exposed edges of insulation. Anchors, supports and other metal projections through insulation on cold surfaces shall be insulated and vapor sealed for a minimum length of 150 mm (6 inches).
- E. Install vapor stops at all insulation terminations on either side of valves, pumps and equipment and particularly in straight lengths of pipe insulation.

- F. Construct insulation on parts of equipment such as cold water pumps and heat exchangers that must be opened periodically for maintenance or repair, so insulation can be removed and replaced without damage. Install insulation with bolted 1 mm thick (20 gage) galvanized steel or aluminum covers as complete units, or in sections, with all necessary supports, and split to coincide with flange/split of the equipment.
- G. Insulation on hot piping and equipment shall be terminated square at items not to be insulated, access openings and nameplates. Cover all exposed raw insulation with white sealer or jacket material.
- H. Protect all insulations outside of buildings with aluminum jacket using lock joint or other approved system for a continuous weather tight system. Access doors and other items requiring maintenance or access shall be removable and sealable.
- I. Plumbing work not to be insulated:
  - 1. Piping and valves of fire protection system.
  - 2. Chromium plated brass piping.
  - 3. Water piping in contact with earth.
  - 4. Small horizontal cold water branch runs in partitions to individual fixtures may be without insulation for maximum distance of 900 mm (3 feet).
  - 5. Distilled water piping.
- J. Apply insulation materials subject to the manufacturer's recommended temperature limits. Apply adhesives, mastic and coatings at the manufacturer's recommended minimum coverage.
- K. Elbows, flanges and other fittings shall be insulated with the same material as is used on the pipe straights.  
Use of polyurethane spray-foam to fill a PVC elbow jacket is prohibited on cold applications.
- L. Firestop Pipe insulation:
  - 1. Provide firestopping insulation at fire and smoke barriers through penetrations. Fire stopping insulation shall be UL listed as defines in Section 07 84 00, FIRESTOPPING.
  - 2. Pipe penetrations requiring fire stop insulation including, but not limited to the following:
    - a. Pipe risers through floors
    - b. Pipe chase walls and floors
    - c. Smoke partitions
    - d. Fire partitions

- M. Freeze protection of above grade outdoor piping (over heat tracing tape): 20 mm (0.75) thick insulation, for all pipe sizes 75 mm (3 inches) and smaller and 25 mm (1 inch) thick insulation for larger pipes. Provide metal jackets for all pipes. Provide for cold water make-up where indicated on the drawings as described in Section 23 21 13, HYDRONIC PIPING (electrical heat tracing systems).
- N. Provide vapor barrier jackets over insulation as follows:
  - 1. All piping exposed to outdoor weather.
  - 2. All interior piping conveying fluids exposed to outdoor air (i.e. in attics, ventilated (not air conditioned) spaces, etc.) below ambient air temperature in high humidity areas.
- O. Provide metal jackets over insulation as follows:
  - a. All plumbing piping exposed to outdoor weather.
  - b. Piping exposed in building, within 1800 mm (6 feet) of the floor, that connects to sterilizers, kitchen and laundry equipment. Jackets may be applied with pop rivets. Provide aluminum angle ring escutcheons at wall, ceiling or floor penetrations.
  - c. A 50 mm (2 inch) overlap is required at longitudinal and circumferential joints.

### 3.2 INSULATION INSTALLATION

- A. Mineral Fiber Board:
  - 1. Faced board: Apply board on pins spaced not more than 300 mm (12 inches) on center each way, and not less than 75 mm (3 inches) from each edge of board. In addition to pins, apply insulation bonding adhesive to entire underside of horizontal metal surfaces. Butt insulation edges tightly and seal all joints with laps and butt strips. After applying speed clips cut pins off flush and apply vapor seal patches over clips.
  - 2. Plain board:
    - a. Insulation shall be scored, beveled or mitered to provide tight joints and be secured to equipment with bands spaced 225 mm (9 inches) on center for irregular surfaces or with pins and clips on flat surfaces. Use corner beads to protect edges of insulation.
    - b. For hot equipment: Stretch 25 mm (1 inch) mesh wire, with edges wire laced together, over insulation and finish with insulating and finishing cement applied in one coat, 6 mm (1/4 inch) thick, trowel led to a smooth finish.



- c. For cold equipment: Apply meshed glass fabric in a tack coat 1.5 to 1.7 square meter per liter (60 to 70 square feet per gallon) of vapor mastic and finish with mastic at 0.3 to 0.4 square meter per liter (12 to 15 square feet per gallon) over the entire fabric surface.
- 3. Cold equipment: 40 mm (1-1/2inch) thick insulation faced with ASJ.
  - a. Water filter, chemical feeder pot or tank.
  - b. Pneumatic, cold storage water and surge tanks.
- 4. Hot equipment: 40 mm (1-1/2 inch) thick insulation faced with ASJ.
  - a. Domestic water heaters and hot water storage tanks (not factory insulated).
  - b. Booster water heaters for dietetics dish and pot washers and for washdown grease-extracting hoods.
- B. Molded Mineral Fiber Pipe and Tubing Covering:
  - 1. Fit insulation to pipe, aligning longitudinal joints. Seal longitudinal joint laps and circumferential butt strips by rubbing hard with a nylon sealing tool to assure a positive seal. Staples may be used to assist in securing insulation. Seal all vapor retarder penetrations on cold piping with a generous application of vapor barrier mastic. Provide inserts and install with metal insulation shields at outside pipe supports. Install freeze protection insulation over heating cable.
  - 2. Contractor's options for fitting, flange and valve insulation:
    - a. Insulating and finishing cement for sizes less than 100 mm (4 inches) operating at surface temperature of 16 degrees C (61 degrees F) or more.
    - b. Factory premolded, one piece PVC covers with mineral fiber, (Form B), inserts. Provide two insert layers for pipe temperatures below 4 degrees C (40 degrees F), or above 121 degrees C (250 degrees F). Secure first layer of insulation with twine. Seal seam edges with vapor barrier mastic and secure with fitting tape.
    - c. Factory molded, ASTM C547 or field mitered sections, joined with adhesive or wired in place. For hot piping finish with a smoothing coat of finishing cement. For cold fittings, 16 degrees C (60 degrees F) or less, vapor seal with a layer of glass fitting tape imbedded between two 2 mm (1/16 inch) coats of vapor barrier mastic.

- d. Fitting tape shall extend over the adjacent pipe insulation and overlap on itself at least 50 mm (2 inches).
3. Nominal thickness in millimeters and inches specified in the schedule at the end of this section.
- D. faced with ASJ.
- F. Flexible Elastomeric Cellular Thermal Insulation:
1. Apply insulation and fabricate fittings in accordance with the manufacturer's installation instructions and finish with two coats of weather resistant finish as recommended by the insulation manufacturer.
  3. Apply sheet insulation to flat or large curved surfaces with 100 percent adhesive coverage. For fittings and large pipe, apply adhesive to seams only.
- G. Calcium Silicate:
1. Minimum thickness in millimeter (inches) specified below for piping other than in boiler plant.

Nominal Thickness Of Calcium Silicate Insulation (Non-Boiler Plant)				
Nominal Pipe Size Millimeters (Inches)	Thru 25 (1)	32 to 75 (1-1/4 to 3)	100-200 (4 to 6)	Over 200 (6)
93-260 degrees C(200- 500 degrees F)(HPS, HPR)	100(4)	125(5)	150(6)	150(6)

2. MRI Quench Vent Insulation: Type I, class D, 150 mm (6 inch) nominal thickness.

### 3.3 COMMISSIONING

- A. Provide commissioning documentation in accordance with the requirements of section 22 08 00 - COMMISSIONING OF PLUMBING SYSTEMS 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 22 08 00 - COMMISSIONING OF PLUMBING SYSTEMS and related sections for contractor responsibilities for system commissioning.

### 3.4 PIPE INSULATION SCHEDULE

Provide insulation for piping systems as scheduled below:

Insulation Thickness Millimeters (Inches)					
		Nominal Pipe Size Millimeters (Inches)			
Operating Temperature Range/Service	Insulation Material	Less than 25 (1)	25 - 32 (1 - 1¼)	38 - 75 (1½ - 3)	100 (4) and Above
38-60 degrees C (100-140 degrees F) (Domestic Hot Water Supply and Return)	Mineral Fiber or Fiberglass (Above ground piping only)	38 (1.5)	38 (1.5)	50 (2.0)	50 (2.0)
(4-16 degrees C (40-60 degrees F) Cold Water and storm water	Mineral Fiber or Fiberglass (Above ground piping only)	25 (1.0)	25 (1.0)	38 (1.5)	38 (1.5)

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**SECTION 22 08 00**  
**COMMISSIONING OF PLUMBING SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The requirements of this Section apply to all sections of Division 22.
- B. This project will have selected building systems commissioned. The complete list of equipment and systems to be commissioned are specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. The commissioning process, which the Contractor is responsible to execute, is defined in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. A Commissioning Agent (CxA) appointed by the Department of Veterans Affairs will manage the commissioning process.

**1.2 RELATED WORK**

- A. Section 01 00 00 GENERAL REQUIREMENTS.
- B. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.
- C. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

**1.3 SUMMARY**

- A. This Section includes requirements for commissioning plumbing systems, subsystems and equipment. This Section supplements the general requirements specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.
- B. The commissioning activities have been developed to support the VA requirements to meet guidelines for Federal Leadership in Environmental, Energy, and Economic Performance.
- C. The commissioning activities have been developed to support the United States Green Building Council (USGBC) LEED™ rating program and to support delivery of project performance in accordance with the Contract Documents developed with the approval of the VA.
  - 1. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" prerequisite of "Fundamental Building Systems Commissioning".
  - 2. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" requirements for the "Enhanced Building System Commissioning" credit.
  - 3. Activities and documentation for the LEED™ section on "Measurement and Verification" requirements for the Measurement and Verification credit.

- D. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for more specifics regarding processes and procedures as well as roles and responsibilities for all Commissioning Team members.

#### **1.4 DEFINITIONS**

- A. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for definitions.

#### **1.5 COMMISSIONED SYSTEMS**

- A. Commissioning of a system or systems specified in this Division is part of the construction process. Documentation and testing of these systems, as well as training of the VA's Operation and Maintenance personnel, is required in cooperation with the VA and the Commissioning Agent.
- B. The following Plumbing systems will be commissioned:
  - 1. Domestic Hot Water Systems (Domestic water heaters, steam-to-hot water converters, hot water circulating pumps and motors, controls, combustion burners/fans/motors).
  - 2. Dental Compressed Air and Vacuum systems.
  - 9. Emergency Plumbing Fixtures (Showers, eye wash stations, water tempering valves, instruments and gages)

#### **1.6 SUBMITTALS**

- A. The commissioning process requires review of selected Submittals. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the VA prior to forwarding to the Contractor. Refer to Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, and SAMPLES for further details.
- B. The commissioning process requires Submittal review simultaneously with engineering review. Specific submittal requirements related to the commissioning process are specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

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

### **PART 3 - EXECUTION**

#### **3.1 PRE-FUNCTIONAL CHECKLISTS**

- A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the

checklists. Completed checklists shall be submitted to the VA and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission. Refer to SECTION 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for submittal requirements for Pre-Functional Checklists, Equipment Startup Reports, and other commissioning documents.

### **3.2 CONTRACTORS TESTS**

- A. Contractor tests as required by other sections of Division 22 shall be scheduled and documented in accordance with Section 01 00 00 GENERAL REQUIREMENTS. The Commissioning Agent will witness selected Contractor tests. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

### **3.3 SYSTEMS FUNCTIONAL PERFORMANCE TESTING:**

- A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the Resident Engineer. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed. See Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS, for additional details.

### **3.4 TRAINING OF VA PERSONNEL**

- A. Training of the VA operation and maintenance personnel is required in cooperation with the Resident Engineer and Commissioning Agent.

Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Resident Engineer after submission and approval of formal training plans. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS and Division 22 Sections for additional Contractor training requirements.

----- END -----

**SECTION 22 11 00**  
**FACILITY WATER DISTRIBUTION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Domestic water systems, including piping, equipment and all necessary accessories as designated in this section.

**1.2 RELATED WORK**

- A. Section 07 84 00, FIRESTOPPING: Penetrations in rated enclosures
- B. Section 09 91 00, PAINTING: Preparation and finish painting and identification of piping systems.
- C. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- D. Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION, PIPE INSULATION.
- E. SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS: Requirements for commissioning, systems readiness checklist, and training.

**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. All items listed in Part 2 - Products.

**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. American National Standards Institute (ANSI):
  - American Society of Mechanical Engineers (ASME): (Copyrighted Society)
  - A13.1-2007.....Scheme for Identification of Piping Systems
  - B16.3-2006.....Malleable Iron Threaded Fittings Classes 150 and 300
  - B16.9-2007..... Gray Iron Threaded Fittings Classes 125 and 250
  - B16.9-2007.....Factory-Made Wrought Butt Welding Fittings ANSI/ASME
  - B16.11-2009.....Forged Fittings, Socket-Welding and Threaded ANSI/ASME
  - B16.12-2009 .....Cast Iron Threaded Drainage Fittings ANSI/ASME
  - B16.15-2006 .....Cast Bronze Threaded Fittings Classes 125 and 250 ANSI/ASME



- B16.18-01 (R2005).....Cast Copper Alloy Solder-Joint Pressure  
Fittings ANSI/ASME
- B16.22-01 (R2005).....Wrought Copper and Copper Alloy Solder Joint  
Pressure Fittings ANSI/ASME Element ANSI/ASME
- NSF/ANSI 61.....Drinking Water System Components - Health  
Effects
- C. American Society for Testing and Materials (ASTM):
- A47/A47M-99(2009).....Ferritic Malleable Iron Castings Revision 1989
- A53/A53M-07.....Pipe, Steel, Black And Hot-Dipped, Zinc-coated  
Welded and Seamless
- A183-03(2009).....Carbon Steel Track Bolts and Nuts
- A269-10.....Standard Specification for Seamless and Welded  
Austenitic Stainless Steel Tubing for General  
Service
- A312/A312M-09.....Seamless, Welded, and Heavily Cold Worked  
Austenitic Stainless Steel Pipes
- A403/A403M-10a.....Standard Specification for Wrought Austenitic  
Stainless Steel Piping Fittings
- A536-84(2009).....Ductile Iron Castings
- A733-03(2009).....Welded and Seamless Carbon Steel and Austenitic  
Stainless Steel Pipe Nipples
- B32-08.....Solder Metal
- B61-08.....Steam or Bronze Castings
- B62-09.....Composition Bronze or Ounce Metal Castings
- B75-02.....Seamless Copper Tube
- B88-09.....Seamless Copper Water Tube
- B300-10.....AWWA Standard for Hypochlorites
- B301-10.....AWWA Standard for Liquid Chlorine
- B584-09a.....Copper Alloy Sand Castings for General  
Applications Revision A
- B687-99(2005) e1.....Brass, Copper, and Chromium-Plated Pipe Nipples
- D2000-08.....Rubber Products in Automotive Applications
- E1120-08.....Standard Specification For Liquid Chlorine
- E1229-08.....Standard Specification For Calcium Hypochlorite
- D. American Water Works Association (AWWA):
- C110-08.....Ductile Iron and Gray Iron Fittings - 75 mm  
thru 1200 mm (3 inch thru 48 inches) for Water  
and other liquids AWWA/ANSI

- C151/A21.51-09.....Ductile-Iron Pipe, Centrifugally Cast in Metal  
Molds or Sand-Lined Molds, for Water or Other  
Liquids AWWA/ ANSI
- C153/A21.53-06.....AWWA Standard for Ductile-Iron Compact Fittings  
for Water Service AWWA/ANSI
- C203-08.....Coal-Tar Protective Coatings and Linings for  
Steel Water Pipelines - Enamel and Tape - Hot  
Applied AWWA/ANSI
- C213-07.....Fusion Bonded Epoxy Coating For The Interior &  
Exterior Of Steel Water Pipelines
- C651-05.....Disinfecting Water Mains
- E. American Welding Society (AWS):
- A5.8/A5.8M:2004.....Filler Metals for Brazing
- F. International Plumbing Code
- International Plumbing Code - 2009
- G. American Society of Sanitary Engineers (ASSE):
- ANSI/ASSE (Plumbing)
- 1001-2008.....Pipe Applied Atmospheric Type Vacuum Breakers
- ANSI/ASSE 1010-2004.....Water Hammer Arresters
- ANSI/ASSE 1018-2001.....Performance for trap seal primer valves -  
potable water supplied.
- ANSI/ASSE (Plumbing)
- 1020-2004.....Pressure Vacuum Breaker Assembly
- H. Plumbing and Drainage Institute (PDI):
- PDI WH-201 2007.....Water Hammer Arrestor

## **1.5 QUALITY ASSURANCE**

- A. Submit prior to welding of steel piping a certificate of Welder's certification. The certificate shall be current and more than one year old.
- B. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be by the same manufacturer as the groove components.
- E. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

## **PART 2 - PRODUCTS**

### **2.2 ABOVE GROUND (INTERIOR) WATER PIPING**

- A. Pipe: Copper tube, ASTM B88, Type K or L, drawn.
- B. Fittings for Copper Tube:

1. Wrought copper or bronze castings conforming to ANSI B16.18 and B16.22. Unions shall be bronze, MSS SP72 & SP 110, Solder or braze joints. Use 95/5 tin and antimony for all soldered joints.

- D. Adapters: Provide adapters for joining screwed pipe to copper tubing.
- E. Solder: ASTM B32 Composition Sb5 HA or HB. Provide non-corrosive flux.
- F. Brazing alloy: AWS A5.8, Classification BCuP.

### **2.3 EXPOSED WATER PIPING**

- A. Finished Room: Use full iron pipe size chrome plated brass piping for exposed water piping connecting fixtures, casework, cabinets, equipment and reagent racks when not concealed by apron including those furnished by the Government or specified in other sections.
  1. Pipe: Fed. Spec. WW-P-351, standard weight.
  2. Fittings: ANSI B16.15 cast bronze threaded fittings with chrome finish, (125 and 250).
  3. Nipples: ASTM B 687, Chromium-plated.
  4. Unions: MSS SP-72, SP-110, Brass or Bronze with chrome finish. Unions 65 mm (2-1/2 inches) and larger shall be flange type with approved gaskets.
- B. Unfinished Rooms, Mechanical Rooms and Kitchens: Chrome-plated brass piping is not required. Paint piping systems as specified in Section 09 91 00, PAINTING.

### **2.5 TRAP PRIMER WATER PIPING:**

- A. Pipe: Copper tube, ASTM B88, type K, hard drawn.
- B. Fittings: Bronze castings conforming to ANSI B16.18 Solder joints.
- C. Solder: ASTM B32 composition Sb5. Provide non-corrosive flux.

### **2.6 STRAINERS**

- A. Provide on high pressure side of pressure reducing valves, on suction side of pumps, on inlet side of indicating and control instruments and equipment subject to sediment damage and where shown on drawings. Strainer element shall be removable without disconnection of piping.
- B. Water: Basket or "Y" type with easily removable cover and brass strainer basket.
- C. Body: Smaller than 80 mm (3 inches), brass or bronze; 80 mm (3 inches) and larger, cast iron or semi-steel.

### **2.7 DIELECTRIC FITTINGS**

- A. Provide dielectric couplings or unions between ferrous and non-ferrous pipe.

## 2.8 STERILIZATION CHEMICALS

- A. Hypochlorites ANSI/AWWA B300-10
- B. Liquid Chlorine ANSI/AWWA B301-10

## 2.9 WATER HAMMER ARRESTER:

- A. Closed copper tube chamber with permanently sealed 410 kPa (60 psig) air charge above a Double O-ring piston. Two high heat Buna-N O-rings pressure packed and lubricated with FDA approved silicone compound. All units shall be designed in accordance with ASSE 1010 for sealed wall installations without an access panel. Size and install in accordance with Plumbing and Drainage Institute requirements (PDI WH 201). Provide water hammer arrestors at:
  - 1. All solenoid valves.
  - 2. All groups of two or more flush valves.
  - 3. All quick opening or closing valves.
  - 4. All medical washing equipment.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Comply with the International Plumbing Code and the following:
  - 1. Install branch piping for water from the piping system and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those furnished by the Government or specified in other sections.
  - 2. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe, except for plastic and glass, shall be reamed to full size after cutting.
  - 3. All pipe runs shall be laid out to avoid interference with other work.
  - 4. Install union and shut-off valve on pressure piping at connections to equipment.
  - 5. Pipe Hangers, Supports and Accessories:
    - a. All piping shall be supported per the International Plumbing Code, Chapter No. 3.
    - b. Shop Painting and Plating: Hangers, supports, rods, inserts and accessories used for pipe supports shall be shop coated with red lead or zinc chromate primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.
    - c. Floor, Wall and Ceiling Plates, Supports, Hangers:
      - 1) Solid or split unplated cast iron.

- 2) All plates shall be provided with set screws.
  - 3) Pipe Hangers: Height adjustable clevis type.
  - 4) Adjustable Floor Rests and Base Flanges: Steel.
  - 5) Concrete Inserts: "Universal" or continuous slotted type.
  - 6) Hanger Rods: Mild, low carbon steel, fully threaded or Threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
  - 7) Riser Clamps: Malleable iron or steel.
  - 8) Rollers: Cast iron.
  - 9) Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.
  - 10) Hangers and supports utilized with insulated pipe and tubing shall have 180 degree (min.) metal protection shield Centered on and welded to the hanger and support. The shield shall be 4 inches in length and be 16 gauge steel. The shield shall be sized for the insulation.
  - 11) Miscellaneous Materials: As specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories. If the vertical distance exceeds 6 m (20 feet) for cast iron pipe additional support shall be provided in the center of that span. Provide all necessary auxiliary steel to provide that support.
  - 12) With the installation of each flexible expansion joint, provide piping restraints for the upstream and downstream section of the piping at the flexible expansion joint. Provide calculations supporting the restraint length design and type of selected restraints.
6. Install chrome plated cast brass escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
  7. Penetrations:
    - a. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Completely fill and seal clearances between raceways and openings with the fire stopping materials.

- b. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.
- B. Piping shall conform to the following:
  - 1. Domestic Water:
    - a. Grade all lines to facilitate drainage. Provide drain valves at bottom of risers and all low points in system. Design domestic hot water circulating lines with no traps.
    - b. Connect branch lines at bottom of main serving fixtures below and pitch down so that main may be drained through fixture. Connect branch lines to top of main serving only fixtures located on floor above.

### 3.2 TESTS

- A. General: Test system either in its entirety or in sections.
- B. Potable Water System: Test after installation of piping and domestic water heaters, but before piping is concealed, before covering is applied, and before plumbing fixtures are connected. Fill systems with water and maintain hydrostatic pressure of 690 kPa (100 psi) gage for two hours. No decrease in pressure is allowed. Provide a pressure gage with a shutoff and bleeder valve at the highest point of the piping being tested.
- C. Reagent Grade Water Systems: Fill system with water and maintain hydrostatic pressure of 690 kPa (100 psi) gage during inspection and prove tight.
- D. All Other Piping Tests: Test new installed piping under 1 1/2 times actual operating conditions and prove tight.

### 3.3 STERILIZATION

- A. After tests have been successfully completed, thoroughly flush and sterilize the interior domestic water distribution system in accordance with AWWA C651.
- B. Use liquid chlorine or hypochlorites for sterilization.

### 3.4 COMMISSIONING

- A. Provide commissioning documentation accordance with the requirements of Section 22 08 00 - COMMISSIONING OF PLUMBING SYSTEMS for all inspection, startup, 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 22 08 00 -

COMMISSIONING OF PLUMBING SYSTEMS and related sections for contractor responsibilities for system commissioning.

- - - E N D - - -

**SECTION 22 13 00**  
**FACILITY SANITARY AND VENT PIPING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section pertains to sanitary sewer and vent systems, including piping, equipment and all necessary accessories as designated in this section.

**1.2 RELATED WORK**

- A. Section 07 84 00, FIRESTOPPING: Penetrations in rated enclosures.
- B. Section 09 91 00, PAINTING: Preparation and finish painting and identification of piping systems.
- C. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING: Pipe Hangers and Supports, Materials Identification.
- D. Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION: Pipe Insulation.
- E. Section 07 92 00 Joint Sealants: Sealant products.

**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. Piping.
  - 2. Floor Drains.
  - 4. Cleanouts.
  - 5. All items listed in Part 2 - Products.
- C. Detailed shop drawing of clamping device and extensions when required in connection with the waterproofing membrane or the floor drain.

**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. American Society of Mechanical Engineers (ASME): (Copyrighted Society)
  - A112.6.3-01 (R 2007)....Standard for Floor and Trench Drains
  - A13.1-07.....Scheme for Identification of Piping Systems
  - B16.3-06.....Malleable Iron Threaded Fittings, Classes 150 and 300.
  - B16.4-06.....Standard for Grey Iron Threaded Fittings  
Classes 125 and 250
  - B16.12-98 (R 2006).....Cast Iron Threaded Drainage Fittings



B16.15-06.....Cast Bronze Threaded Fittings, Classes 125 and  
250

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

A47/A47M-99 (R 2004)....Standard Specification for Steel Sheet,  
Aluminum Coated, by the Hot Dip Process  
A53/A53M-07.....Standard Specification for Pipe, Steel, Black  
And Hot-Dipped, Zinc-coated, Welded and  
Seamless  
A74-06.....Standard Specification for Cast Iron Soil Pipe  
and Fittings  
A183-03.....Standard Specification for Carbon Steel Track  
Bolts and Nuts  
A536-84(R 2004).....Standard Specification for Ductile Iron  
Castings  
B32-08.....Standard Specification for Solder Metal  
B75-02.....Standard Specification for Seamless Copper Tube  
B306-02.....*Standard Specification for Copper Drainage Tube*  
(DWV)  
B584-06a.....Standard Specification for Copper Alloy Sand  
Castings for General Applications  
C564-03a.....Standard Specification for Rubber Gaskets for  
Cast Iron Soil Pipe and Fittings  
D2000-08.....Standard Classification System for Rubber  
Products in Automotive Applications

D. International Code Council:

IPC-06.....International Plumbing Code

E. Cast Iron Soil Pipe Institute (CISPI):

301-05.....Hubless Cast Iron Soil Pipe and Fittings for  
Sanitary and Storm Drain, Waste, and Vent  
Piping Applications  
310-04.....Coupling for Use in Connection with Hubless  
Cast Iron Soil Pipe and Fittings for Sanitary  
and Storm Drain, Waste, and Vent Piping  
Applications

F. American Society of Sanitary Engineers (ASSE):

1018-01.....Trap Seal Primer Valves - Potable, Water  
Supplied

G. Plumbing and Drainage Institute (PDI):

PDI WH-201.....Water Hammer Arrestor

## **PART 2 - PRODUCTS**

### **2.1 SANITARY WASTE, DRAIN, AND VENT PIPING**

- A. Cast iron waste, drain, and vent pipe and fittings
  - 1. Cast iron waste, drain, and vent pipe and fittings shall be used for the following applications:
    - a. pipe buried in or in contact with earth
    - b. sanitary pipe extensions to a distance of approximately 1500 mm (5 feet) outside of the building.
    - c. interior waste and vent piping above grade.
  - 2. Cast iron Pipe shall be bell and spigot or hubless (plain end or no-hub or hubless).
  - 3. The material for all pipe and fittings shall be cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301, ASTM A-888, or ASTM A-74.
  - 4. Joints for hubless pipe and fittings shall conform to the manufacturer's installation instructions. Couplings for hubless joints shall conform to CISPI 310. Joints for hub and spigot pipe shall be installed with compression gaskets conforming to the requirements of ASTM Standard C-564 or be installed with lead and oakum.
- B. Copper Tube, (DWV):
  - 1. Copper DWV tube sanitary waste, drain and vent pipe may be used for piping above ground, except for urinal drains.
  - 2. The copper DWV tube shall be drainage type, drawn temper conforming to ASTM B306.
  - 3. The copper drainage fittings shall be cast copper or wrought copper conforming to ASME B16.23 or ASME 16.29.
  - 4. The joints shall be lead free, using a water flushable flux, and conforming to ASTM B32.

### **2.2 EXPOSED WASTE PIPING**

- A. Full iron pipe size chrome plated brass piping shall be used in finished rooms for exposed waste piping connecting fixtures, casework, cabinets, equipment and reagent racks when not concealed by apron including those furnished by the Government or specified in other sections.
  - 1. The Pipe shall meet Fed. Spec. WW-P-351, standard weight.

2. The Fittings shall conform to ANSI B16.15, cast bronze threaded fittings with chrome finish, (125 and 250).
3. Nipples shall conform to ASTM B 687, Chromium-plated.
4. Unions shall be brass or bronze with chrome finish. Unions 65 mm (2-1/2 inches) and larger shall be flange type with approved gaskets.

B. In unfinished Rooms such as mechanical Rooms and Kitchens, Chrome-plated brass piping is not required. The pipe materials specified under the paragraph "Sanitary Waste, Drain, and Vent Piping" can be used. The sanitary pipe in unfinished rooms shall be painted as specified in Section 09 91 00, PAINTING.

### **2.3 SPECIALTY PIPE FITTINGS**

- A. Transition pipe couplings shall join piping with small differences in outside diameters or different materials. End connections shall be of the same size and compatible with the pipes being joined. The transition coupling shall be elastomeric, sleeve type reducing or transition pattern and include shear and corrosion resistant metal, tension band and tightening mechanism on each end. The transition coupling sleeve coupling shall be of the following material:
  1. For cast iron soil pipes, the sleeve material shall be rubber conforming to ASTM C564.
  2. For dissimilar pipes, the sleeve material shall be PVC conforming to ASTM D5926, or other material compatible with the pipe materials being joined.
- B. The dielectric fittings shall conform to ASSE 1079 with a pressure rating of 860 kPa (125 psig) at a minimum temperature of 82°C (180°F). The end connection shall be solder joint copper alloy and threaded ferrous.
- C. Dielectric flange insulating kits shall be of non conducting materials for field assembly of companion flanges with a pressure rating of 1035 kPa (150 psig). The gasket shall be neoprene or phenolic. The bolt sleeves shall be phenolic or polyethylene. The washers shall be phenolic with steel backing washers.
- D. The di-electric nipples shall be electroplated steel nipple complying with ASTM F 1545 with a pressure ratings of 2070 kPa (300 psig) at 107°C (225°F). The end connection shall be male threaded. The lining shall be inert and noncorrosive propylene.

## 2.4 CLEANOUTS

- A. Cleanouts shall be the same size as the pipe, up to 100 mm (4 inches); and not less than 100 mm (4 inches) for larger pipe. Cleanouts shall be easily accessible and shall be gastight and watertight. Minimum clearance of 600 mm (24 inches) shall be provided for clearing a clogged sanitary line.
- B. Floor cleanouts shall be gray iron housing with clamping device and round, secured, scoriated, gray iron cover conforming to ASME A112.36.2M. A gray iron ferrule with hubless, socket, inside calk or spigot connection and counter sunk, taper-thread, brass or bronze closure plug shall be included. The frame and cover material and finish shall be nickel-bronze copper alloy with a square shape. The cleanout shall be vertically adjustable for a minimum of 50 mm (2 inches). When a waterproof membrane is used in the floor system, clamping collars shall be provided on the cleanouts. Cleanouts shall consist of wye fittings and eighth bends with brass or bronze screw plugs. Cleanouts in the resilient tile floors, quarry tile and ceramic tile floors shall be provided with square top covers recessed for tile insertion. In the carpeted areas, carpet cleanout markers shall be provided. Two way cleanouts shall be provided where indicated on drawings and at every building exit. The loading classification for cleanouts in sidewalk areas or subject to vehicular traffic shall be heavy duty type.
- C. Cleanouts shall be provided at or near the base of the vertical stacks with the cleanout plug located approximately 600 mm (24 inches) above the floor. If there are no fixtures installed on the lowest floor, the cleanout shall be installed at the base of the stack. The cleanouts shall be extended to the wall access cover. Cleanout shall consist of sanitary tees. Nickel-bronze square frame and stainless steel cover with minimum opening of 150 by 150 mm (6 by 6 inches) shall be furnished at each wall cleanout. Where the piping is concealed, a fixture trap or a fixture with integral trap, readily removable without disturbing concealed pipe, shall be accepted as a cleanout equivalent providing the opening to be used as a cleanout opening is the size required.
- D. In horizontal runs above grade, cleanouts shall consist of cast brass tapered screw plug in fitting or caulked/hubless cast iron ferrule.

Plain end (hubless) piping in interstitial space or above ceiling may use plain end (hubless) blind plug and clamp.

## **2.5 FLOOR DRAINS**

- A. All Floor Drain types are shown on the drawings under the plumbing fixture schedule

## **2.6 TRAPS**

- A. Traps shall be provided on all sanitary branch waste connections from fixtures or equipment not provided with traps. Exposed brass shall be polished brass chromium plated with nipple and set screw escutcheons. Concealed traps may be rough cast brass or same material as pipe connected to. Slip joints are not permitted on sewer side of trap. Traps shall correspond to fittings on cast iron soil pipe or steel pipe respectively, and size shall be as required by connected service or fixture.  
when serving only one trap.

## **2.9 WATERPROOFING**

- A. A sleeve flashing device shall be provided at points where pipes pass through membrane waterproofed floors or walls. The sleeve flashing device shall be manufactured, cast iron fitting with clamping device that forms a sleeve for the pipe floor penetration of the floor membrane. A galvanized steel pipe extension shall be included in the top of the fitting that will extend 50 mm (2 inches) above finished floor and galvanized steel pipe extension in the bottom of the fitting that will extend through the floor slab. A waterproof caulked joint shall be provided at the top hub.
- B. Walls: See detail shown on drawings.

## **PART 3 - EXECUTION**

### **3.1 PIPE INSTALLATION**

- A. The pipe installation shall comply with the requirements of the International Plumbing Code (IPC) and these specifications.
- B. Branch piping shall be installed for waste from the respective piping systems and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those furnished by the Government or specified in other sections.
- C. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe shall be reamed to full size after cutting.
- D. All pipe runs shall be laid out to avoid interference with other work.
- E. The piping shall be installed above accessible ceilings where possible.

- F. The piping shall be installed to permit valve servicing or operation.
- G. Unless specifically indicated on the drawings, the minimum slope shall be 2% slope.
- H. The piping shall be installed free of sags and bends.
- J. Changes in direction for soil and waste drainage and vent piping shall be made using appropriate branches, bends and long sweep bends. Sanitary tees and short sweep quarter bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Long turn double wye branch and eighth bend fittings shall be used if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Proper size of standard increaser and reducers shall be used if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Buried soil and waste drainage and vent piping shall be laid beginning at the low point of each system. Piping shall be installed true to grades and alignment indicated with unbroken continuity of invert. Hub ends shall be placed upstream. Required gaskets shall be installed according to manufacturer's written instruction for use of lubricants, cements, and other installation requirements.
- L. Cast iron piping shall be installed according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings"
- M. Aboveground copper tubing shall be installed according to CDA's "Copper Tube Handbook".

### 3.2 JOINT CONSTRUCTION

- A. Hub and spigot, cast iron piping with gasket joints shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Hub and spigot, cast iron piping with calked joints shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
- C. Hubless or No-hub, cast iron piping shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless piping coupling joints.
- D. For threaded joints, thread pipe with tapered pipe threads according to ASME B1.20.1. The threads shall be cut full and clean using sharp disc

cutters. Threaded pipe ends shall be reamed to remove burrs and restored to full pipe inside diameter. Pipe fittings and valves shall be joined as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is required by the pipe service
2. Pipe sections with damaged threads shall be replaced with new sections of pipe.

E. Copper tube and fittings with soldered joints shall be joined according to ASTM B828. A water flushable, lead free flux conforming to ASTM B813 and a lead free alloy solder conforming to ASTM B32 shall be used.

### **3.3 SPECIALTY PIPE FITTINGS**

- A. Transition coupling shall be installed at pipe joints with small differences in pipe outside diameters.
- B. Dielectric fittings shall be installed at connections of dissimilar metal piping and tubing.

### **3.3 PIPE HANGERS, SUPPORTS AND ACCESSORIES:**

- A. All piping shall be supported according to the International Plumbing Code (IPC), Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, and these specifications. Where conflicts arise between these the code and Section 22 05 11, the most restrictive or the requirement that specifies supports with highest loading or shortest spacing shall apply.
- B. Hangers, supports, rods, inserts and accessories used for pipe supports shall be shop coated with zinc chromate primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.
- C. Horizontal piping and tubing shall be supported within 300 mm (12 inches) of each fitting or coupling.
- D. Horizontal cast iron piping shall be supported with the following maximum horizontal spacing and minimum hanger rod diameters:
  1. 40 mm or DN40 to 50 mm or DN50 (NPS 1-1/2 inch to NPS 2 inch): 1500 mm (60 inches) with 10 mm (3/8 inch) rod.
  2. 80 mm or DN 80 (NPS 3 inch): 1500 mm (60 inches) with 13 mm (1/2 inch) rod.
  3. 100 mm or DN100 to 125 mm or DN125 (NPS 4 to NPS 5): 1500 mm (60 inches) with 16 mm (5/8 inch) rod.
  4. 150 mm or DN150 to 200 mm or DN200 (NPS 6 inch to NPS 8 inch): 1500 mm (60 inches) with 19 mm (3/4 inch) rod.

5. 250 mm or DN250 to 300 mm or DN 300 (NPS 10 inch to NPS 12 inch):  
1500 mm (60 inch) with 22 mm (7/8 inch) rod.
- F. Vertical piping and tubing shall be supported at the base, at each floor, and at intervals no greater than 4.57 m (15 feet).
- G. In addition to the requirements in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, floor, Wall and Ceiling Plates, Supports, Hangers shall have the following characteristics:
  1. Solid or split unplated cast iron.
  2. All plates shall be provided with set screws.
  3. Height adjustable clevis type pipe hangers.
  4. Adjustable floor rests and base flanges shall be steel.
  5. Hanger rods shall be low carbon steel, fully threaded or threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
  7. Riser clamps shall be malleable iron or steel.
  8. Rollers shall be cast iron.
  9. See Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, for requirements on insulated pipe protective shields at hanger supports.
- H. Miscellaneous materials shall be provided as specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories. If the vertical distance exceeds 6 m (20 feet) for cast iron pipe additional support shall be provided in the center of that span. All necessary auxiliary steel shall be provided to provide that support.
- I. Cast escutcheon with set screw shall be provided at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
- J. Penetrations:
  1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, a fire stop shall be installed that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Clearances between raceways and openings shall be completely filled and sealed with the fire stopping materials.
  2. Water proofing: At floor penetrations, clearances shall be completely sealed around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.



K. Piping shall conform to the following:

1. Waste and Vent Drain to main stacks:

Pipe Size	Minimum Pitch
80 mm or DN 80 (3 inches) and smaller	2%
100 mm or DN 100 (4 inches) and larger	1%

2. Exhaust vents shall be extended separately through roof. Sanitary vents shall not connect to exhaust vents.

### 3.4 TESTS

A. Sanitary waste and drain systems shall be tested either in its entirety or in sections.

B. Waste System tests shall be conducted before trenches are backfilled or fixtures are connected. A water test or air test shall be conducted, as directed.

1. If entire system is tested for a water test, tightly close all openings in pipes except highest opening, and fill system with water to point of overflow. If the waste system is tested in sections, tightly plug each opening except highest opening of section under test, fill each section with water and test with at least a 3 m (10 foot) head of water. In testing successive sections, test at least upper 3 m (10 feet) of next preceding section so that each joint or pipe except upper most 3 m (10 feet) of system has been submitted to a test of at least a 3 m (10 foot) head of water. Water shall be kept in the system, or in portion under test, for at least 15 minutes before inspection starts. System shall then be tight at all joints.

2. For an air test, an air pressure of 35 kPa (5 psig) gage shall be maintained for at least 15 minutes without leakage. A force pump and mercury column gage shall be used for the air test.

3. After installing all fixtures and equipment, open water supply so that all p-traps can be observed. For 15 minutes of operation, all p-traps shall be inspected for leaks and any leaks found shall be corrected.

3. Final Tests: Either one of the following tests may be used.

- a. Smoke Test: After fixtures are permanently connected and traps are filled with water, fill entire drainage and vent systems with smoke under pressure of 1.3 kPa (1 inch of water) with a smoke machine. Chemical smoke is prohibited.
- b. Peppermint Test: Introduce (2 ounces) of peppermint into each line or stack.

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**SECTION 22 40 00****PLUMBING FIXTURES****PART 1 - GENERAL****1.1 DESCRIPTION**

Plumbing fixtures, associated trim and fittings necessary to make a complete installation from wall or floor connections to rough piping, and certain accessories.

**1.2 RELATED WORK**

- A. Sealing between fixtures and other finish surfaces: Section 07 92 00, JOINT SEALANTS.
- B. Flush panel access doors: Section 08 31 13, ACCESS DOORS AND FRAMES.
- C. Through bolts: Section 10 21 13, TOILET COMPARTMENTS.
- D. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- E. SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.  
Requirements for commissioning, systems readiness checklist, and training.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submit plumbing fixture information in an assembled brochure, showing cuts and full detailed description of each fixture.

**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. American National Standard Institute (ANSI):  
The American Society of Mechanical Engineers (ASME):  
A112.6.1M-02(R2008).....Floor Affixed Supports for Off-the-Floor  
Plumbing Fixtures for Public Use  
A112.19.1M-08 .....Enameled Cast Iron Plumbing Fixtures  
A112.19.2M-03.....Vitreous China Plumbing Fixtures  
A112.19.3-2001(R2008)...Stainless Steel Plumbing Fixtures (Designed for  
Residential Use)
- C. American Society for Testing and Materials (ASTM):  
A276-2010 .....Stainless and Heat-Resisting Steel Bars and  
Shapes  
WW-P-541-E/GEN .....Plumbing Fixtures with Amendment 1
- D. National Association of Architectural Metal Manufacturers (NAAMM): NAAMM  
AMP 500-505  
Metal Finishes Manual (1988)

- E. American Society of Sanitary Engineers (ASSE):  
1016-05.....Performance Requirements for Individual  
Thermostatic, Pressure Balancing and Combination  
Pressure Balancing and Thermostatic Control  
Valves for Individual Fixture Fittings
- F. National Sanitation Foundation (NSF)/American National Standards  
Institute (ANSI):  
61-2009 .....Drinking Water System Components-Health Effects
- G. American with Disabilities Act (A.D.A) Section 4-19.4 Exposed Pipes and  
Surfaces
- H. Environmental Protection Agency EPA PL 93-523 1974; A 1999) Safe  
Drinking Water Act.
- I. International Building Code, ICC IPBC 2009.

## PART 2 - PRODUCTS

## 2.1 STAINLESS STEEL

- A. Corrosion-resistant Steel (CRS):
1. Plate, Sheet and Strip: CRS flat products shall conform to chemical composition requirements of any 300 series steel specified in ASTM A276.
  2. Finish: Exposed surfaces shall have standard polish (ground and polished) equal to NAAMM finish Number 4.
- B. Die-cast zinc alloy products are prohibited.

## 2.2 STOPS

- A. Provide lock-shield loose key or screw driver pattern angle stops, straight stops or stops integral with faucet, with each compression type faucet whether specifically called for or not, including sinks in wood and metal casework, laboratory furniture and pharmacy furniture. Locate stops centrally above or below fixture in accessible location.
- B. Furnish keys for lock shield stops to Resident Engineer.
- C. Supply from stops not integral with faucet shall be chrome plated copper flexible tubing or flexible stainless steel with inner core of non-toxic polymer.
- D. Supply pipe from wall to valve stop shall be rigid threaded IPS copper alloy pipe, i.e. red brass pipe nipple, chrome plated where exposed.

### 2.3 ESCUTCHEONS

Heavy type, chrome plated, with set screws. Provide for piping serving plumbing fixtures and at each wall, ceiling and floor penetrations in exposed finished locations and within cabinets and millwork.

## 2.4 LAMINAR FLOW CONTROL DEVICE

- A. Smooth, bright stainless steel or satin finish, chrome plated metal laminar flow device shall provide non-aeration, clear, coherent laminar flow that will not splash in basin. Device shall also have a flow control restrictor and have vandal resistant housing.
- B. Flow Control Restrictor:
  - 1. Capable of restricting flow from 95 ml/s to 110 ml/s (1.5 gpm to 1.7 gpm) for lavatories; 125 ml/s to 140 ml/s (2.0 gpm to 2.2 gpm) for sinks P-505 through P-520, P-524 and P-528; and 170 ml/s to 190 ml/s (2.75 gpm to 3.0 gpm) for dietary food preparation and rinse sinks or as specified.
  - 2. Compensates for pressure fluctuation maintaining flow rate specified above within 10 percent between 170 kPa and 550 kPa (25 psi and 80 psi).
  - 3. Operates by expansion and contraction, eliminates mineral/sediment build-up with self-cleaning action, and is capable of easy manual cleaning.

## 2.5 CARRIERS

- A. ASME/ANSI A112.6.1M, with adjustable gasket faceplate chair carriers for wall hung closets with auxiliary anchor foot assembly, hanger rod support feet, and rear anchor tie down.
- B. ASME/ANSI A112.6.1M, lavatory, steel plate as detailed on drawing. All lavatory chair carriers shall be capable of supporting the lavatory with a 250-pound vertical load applied at the front of the fixture.
- C. Where water closets, lavatories or sinks are installed back-to-back and carriers are specified, provide one carrier to serve both fixtures in lieu of individual carriers. The drainage fitting of the back to back carrier shall be so constructed that it prevents the discharge from one fixture from flowing into the opposite fixture.

## 2.6 PLUMBING FIXTURES

- A. All plumbing fixtures, faucets, drains, fixture carriers, etc. are shown on the drawings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Fixture Setting: Opening between fixture and floor and wall finish shall be sealed as specified under Section 07 92 00, JOINT SEALANTS.
- B. Supports and Fastening: Secure all fixtures, equipment and trimmings to partitions, walls and related finish surfaces. Exposed heads of bolts and nuts in finished rooms shall be hexagonal, polished chrome plated brass with rounded tops.

- C. Through Bolts: For free standing marble and metal stud partitions refer to Section 10 21 13, TOILET COMPARTMENTS.
- D. Toggle Bolts: For hollow masonry units, finished or unfinished.
- E. Expansion Bolts: For brick or concrete or other solid masonry. Shall be 6 mm (1/4 inch) diameter bolts, and to extend at least 76 mm (3 inches) into masonry and be fitted with loose tubing or sleeves extending into masonry. Wood plugs, fiber plugs, lead or other soft metal shields are prohibited.
- F. Power Set Fasteners: May be used for concrete walls, shall be 6 mm (1/4 inch) threaded studs, and shall extend at least 32 mm (1 1/4 inches) into wall.
- G. Tightly cover and protect fixtures and equipment against dirt, water and chemical or mechanical injury.
- H. Where water closet waste pipe has to be offset due to beam interference, provide correct and additional piping necessary to eliminate relocation of water closet.
- I. Do not use aerators on lavatories and sinks.

### **3.2 CLEANING**

At completion of all work, fixtures, exposed materials and equipment shall be thoroughly cleaned.

### **3.4 COMMISSIONING**

- A. Provide commissioning documentation in accordance with the requirements of Section 22 08 00 - COMMISSIONING OF PLUMBING SYSTEMS for all inspection, startup, 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 22 08 00 - COMMISSIONING OF PLUMBING SYSTEMS and related sections for contractor responsibilities for system commissioning.

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**SECTION 22 61 13.74****DENTAL COMPRESSED-AIR PIPING****PART 1 - GENERAL****1.1 DESCRIPTION**

This section describes the requirements for central dental compressed air piping, including all necessary piping, fittings, valves, cabinets, outlets, gages.

**1.2 RELATED WORK**

- A. Section 07 84 00, FIRESTOPPING: Sealing around pipe penetrations to maintain the integrity of time rated construction.
- B. Section 07 92 00, JOINT SEALANTS: Sealing around pipe penetrations through the floor to prevent moisture migration.
- D. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING: General requirements and items common to more than one section of Division 22.
- E. Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING: Exposed piping.
- F. Section 22 61 19.74, DENTAL COMPRESSED AIR EQUIPMENT: Exposed piping.
- H. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.

**1.3 QUALITY ASSURANCE**

- A. Installer qualifications shall meet those qualifications stated in ASSE standard #6010.
- B. Medical Gas System Testing Organization:
  - 1. The testing shall be conducted by a party technically competent and experienced in the field of medical gas pipeline testing. Such testing shall be performed by a party other than the installing contractor.
  - 2. The testing personnel shall be qualified according to ASSE standard #6020 for inspectors and ASSE Standard #6030 for verifiers.
  - 3. Names of three projects where testing of medical gas systems has been performed shall be submitted by the testing agency for review. The list of three references shall include the name of the project, names of such persons at that project who supervised the work for the project owner, or who accepted the report for the project owner, and a written statement that the projects listed required work of similar scope to that set forth in this specification.
  - 4. The testing agency's detailed procedure to be followed in the testing of this project shall be submitted. These procedures shall

- be in compliance with current NFPA and state adoption and shall include details of the testing sequence, procedures for cross connection tests, outlet function tests, alarm tests, and purity tests, as required by NFPA 99. Data on test methods, types of equipment to be used, and calibration sources and method references for purity tests procedures shall be submitted.
- C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them on Auto-Cad version (2004) provided on compact disk or DVD. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.
  - D. Certification documentation shall be provided prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and a certification that all results of tests were within limits specified.
  - E. Brazing process and operators shall be qualified according to ASME Boiler and Pressure Vessel code: Section IX, "Welding and Brazing Qualifications," or AWS B2.2, "Standard for Brazing Procedure and Performance Qualification.
  - F. The electrical devices and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency and marked for its intended use.
  - G. All work shall comply with NFPA 99, "Health Care Facilities"

#### **1.4 SUBMITTAL**

- A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Piping and fittings
  - 2. Valves.
  - 3. Outlets.
  - 5. Gages.
  - 6. Switches (pressure).
  - 7. Alarm components



- C. Station Outlets and Inlets: A letter shall be submitted from manufacturer stating that outlets and inlets are designed, manufactured, and shall comply with NFPA 99. Outlets and inlets shall bear label of approval as assembly of Underwriters Laboratories, Inc. or Associated Factory Mutual Research Corporation. In lieu of above labels, certificate may be submitted by a nationally recognized independent testing laboratory, satisfactory to the Contracting Officer, certifying that materials, appliances and assemblies conform to published standards, including methods of tests, of above organizations.
- D. Certification: The completed systems shall be certified having been installed, tested, purged and analyzed in accordance with the requirements of this specification.
- E. Qualification data for the installer and testing agency/Verify shall be submitted.

#### 1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the test by the basic designation only.
- C. American National Standards Institute (ANSI):
  - A13.1-07.....Scheme for the Identification of Piping Systems
  - B16.3-98.....Malleable Iron Threaded Fittings
  - B16.22-01 (R 2005).....Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
  - B40.1-06.....Pressure Gauges and Gauge Attachment
- D. American Society for Testing and Materials (ASTM):
  - A47-99 (R 2004).....Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process
  - A53-07.....Standard Specification for Pipe, Steel, Black, and Hot Dipped Zinc Coated, Welded and Seamless
  - A536-84( R2004).....Standard Specification for Ductile Iron Castings
  - B819-00 (R 2006).....Standard Specification for Seamless Copper Tube for Medical Gas Systems
- E. American Society of Mechanical Engineers (ASME):
  - Section IX-07.....Welding and Brazing Qualifications
- F. American Welding Society (AWS):

- AWS A5.8-04 (R 2004)....Specification for Filler Metals for Brazing and Braze Welding
- AWS B2.2-91.....Standard for Brazing Procedure and Performance Qualification (Modified per NFPA 99)
- G. Compressed Gas Association (CGA):
- G-4.1-04.....Cleaning Equipment for Oxygen Service
- G-10.1-04.....Nitrogen, Commodity
- P-9-01.....Inert Gases Argon, Nitrogen and Helium
- V-1-03.....Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connection
- V-5-05 .....Diameter Index Safety System (Non Interchangeable Low Pressure Connections for Medical Gas Applications)
- H. National Fire Protection Association (NFPA):
- 99-05.....Health Care Facilities
- I. United States Pharmacopoeia XXI/National Formulary XVI (USP/NF).
- J. National Association of Architectural Metal Manufacturers (NAAMM):
- Metal Finishes Manual, Dated January 1988.
- K. Manufacturing Standardization Society: (MSS)
- MSS-SP-72-99.....Standard for Ball Valves with Flanged or Butt-Welding Ends for General Service
- MSS-SP-73-03.....Brazing Joints for Copper and Copper Alloy Pressure Fittings
- MSS-SP-110-96.....Ball Valves Threaded, Socket Welding, Solder Joint, Grooved and Flared Ends
- L. American Society of Sanitary Engineering (ASSE):
- 6010.....Professional Standard for Medical Gas Systems  
Professional: Medical Gas Systems Installers
- 6020.....Professional Standard for Medical Gas Systems  
Professional: Medical Gas Systems Inspectors
- 6030.....Professional Standard for Medical Gas Systems  
Professional: Medical Gas Systems Verifiers

#### 1.6 PROJECT CONDITIONS

- A. Interruption of existing medical air systems shall not be made without the coordination of the Medical Center. The medical center shall be notified 14 days in advance of proposed interruption. The interruption shall not be made without the written permission from the Medical Center.

**PART 2 - PRODUCTS****2.1 PIPING**

- A. Copper medical gas tube shall be type K or L, seamless, drawn temper meeting ASTM B819 that has been cleaned, purged, and sealed for medical gas service by the pipe manufacturer. Standard color markings "ACR/MED" shall be in green for Type K and in blue for type L tubing.
- B. Wrought copper fittings shall be solder joint, dimensions for brazed joints complying with ASME B16.22.
- C. Brazing filler Metals shall be BCuP series, copper-phosphorus allows for general duty brazing conforming to AWS A5.8. C. Screw Joints shall be made with Degreased polytetrafluoroethylene (teflon) tape.
- D. Piping identification labels shall be applied in accordance with NFPA 99. Supplementary color identification shall be in accordance with CGA pamphlet C-9.
- E. Temperature and pressure ratings of Memory metal couplings shall be not less than that of a brazed joint shall be permitted. The memory metal couplings shall be made of ASTM F 2063, nickel titanium, shape memory alloy, cleaned, purged, and sealed for medical gas service.

**2.2 VALVES**

- A Valves shall be cleaned purged, and bagged according to CGA G-4.1 for oxygen service.
- B. Ball:
  - 1. Ball valves 100 millimeters or DN100 (4 inches) and smaller shall be full port, chrome plated brass with PTFE or TGFE seats, lever type handle with locking device, blowout proof stem with PTFE or TFE seal and ends manufactured according to ASTM B 819 with copper tube extensions. The ball valve shall have a pressure rating of 2070 kPa (300 psig).
- C. Check:
  - 1. Check valves 80 millimeters or DN80 (3 inches) and smaller shall be spring loaded with ends manufactured according to ASTM B819 with copper tube extensions. The check valve shall have a pressure rating of 2070 kPa (300 psig).
- D. Zone Valves:
  - 1. Zone valves shall be three-piece body, brass or bronze full port, chrome plated brass ball valve with gage with PTFE or TGFE seats, lever type handle with locking device, blowout proof stem with PTFE or TFE seal and ends manufactured according to ASTM B 819 with

copper tube extensions. The ball valve shall have a pressure rating of 2070 kPa (300 psig).

### **2.3 ZONE VALVE BOXES**

- A. Zone Valve boxes shall be formed steel with anchors for recessed mounted and includes holes with grommets in the box sides for tubing extension protection. The zone valve box shall be of the size for single or multiple valves as indicated with pressure gages and space for manual operation of valves.
- B. The interior finish shall be factory applied white enamel.
- C. The cover plate shall be stainless steel with NAAMM AMP 503, No. 4 finish and frangible or removable windows. The valve box windows shall be clear or tinted transparent plastic with labeling that includes rooms served according to NFPA 99.

### **2.4 OUTLETS**

- A. The outlet shall be for specific medical/dental compressed air pressure and service listed. Rough-in assemblies shall be included. Recessed units shall be provided unless indicated.
- B. Finish assembly shall include primary check valve, double seals to prevent air leakage and cover plate with service label.
- C. Quick coupler service connections shall include a pressure outlet with non-interchangeable keyed indexing and constructed to permit one-handed connection and removal of equipment using a positive locking ring that retains the equipment stem in valve during use.
- D. DISS service connection outlets shall comply with CGA V-5 with threaded indexing constructed to permit one handed connection and removal of equipment.

### **2.5 GAGES, PRESSURE**

- A. Pressure gages used for testing purposes shall be listed for dental compressed air.
- B. Pressure gages for line pressure use adjacent to source equipment shall be 115 millimeter (4-1/2 inch) diameter, accuracy to within 2%. The pressure range shall be twice the operating pressure. Dial graduations and figures shall be black on white background. Gage shall be cleaned and listed for oxygen use and marked "USE NO OIL". The pressure gage shall comply with ANSI B40.1 and have a gage cock. , and marked "USE NO OIL". Install with gage cock.
- C. For all services downstream of main shutoff valve, the pressure gages shall be manufactured expressly for oxygen use but labeled for dental

air service and marked "USE NO OIL", 40 mm (1-1/2 inch) diameter gage with dial range 1-2050 kPa (1-300 psi).

### **PART 3 EXECUTION**

#### **3.1 PREPERATION**

- A. All dental air tube and fittings, valves, gages, and other components shall be of oil, grease, and other readily oxidizable materials as required according to CGA G-4.1, "Cleaning Equipment for Oxygen Service.
- B. All dental air tube and components shall be washed in hot, alkaline cleaner water solution of sodium carbonate or tri-sodium phosphate in proportion of .453 kg (one pound) of chemical to 11.3 liters (three gallons) of water. All components shall be scrubbed and rinsed using new cleaning pads.

#### **3.2 INSTALLATION**

- A. Pipe, fitting, and component installation shall conform to NFPA 99.
- B. New pipe to existing pipe connections shall be connected with memory metal couplings.
- C. Dental air piping shall use either type L or K, copper medical gas tube, wrought copper fittings, and brazed joints.
- D. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, shall be used for pipe penetrations and sleeves.
- E. Pipe installation shall comply with ASSE standard #6010.
- F. Pipes indicated to be exposed and piping in Mechanical rooms and utility areas shall be installed parallel or at right angles to building walls.
- G. Piping above ceilings shall be installed to allow for the removal of ceiling tiles.
- H. Air and drain piping shall be installed at a one percent slope.
- I. Nipples, unions, special fittings shall be installed with pressure ratings same as or higher than system pressure rating.
- J. Eccentric reduces shall be used when dental air piping is reduced in the direction of flow with bottoms of both pipes and reduced fitting flush with bottom of pipe.
- K. Branch connections shall be installed from the top of the main.
- L. Pressure gages shall be installed on discharge piping from each compressor and on each receiver.
- N. Open ends of tube shall be capped or plugged at all times or otherwise sealed until final assembly.

- O. Piping shall be cut square and accurately with a tube cutter (sawing not permitted) to measurements determined at place of installation. Pipe shall be reamed to remove burrs, being careful not to expand tube, and so no chips of copper remain in the tube. Piping shall be worked into place without springing or forcing. Tube shall be bottomed in socket so there are no gaps between tube and fitting. Care shall be exercised in handling equipment and tools used in cutting or reaming of tube to prevent oil or grease being introduced into tubing. Where contamination has occurred, material shall be no longer suitable for dental air service.
- P. Spacing of Hangers shall comply with NFPA 99.
- Q. Valves and other equipment shall be rigidly supported to prevent strain on tube or joints.
- R. While being brazed, joints shall be continuously purged with oil-free dry nitrogen. The flow of purge gas shall be maintained until joint is cool to the touch.
- S. Pipe fittings shall be used for all changes in direction. Tube shall not be bent or forced into place.
- T. Pressures and vacuum switches, transmitters, and gauges shall be installed to be easily accessed, and provide access panel where installed above plaster ceiling. Pressure switches and sensors shall be installed for gas specific demand check valves.
- V. Pipe labeling shall be applied during installation process and not after installation is completed. The size of legend letters shall be in accordance with ANSI A13.1.
- W. Compressor intake shall be piped to a source of clean ambient air as indicated in NFPA 99.
- X. After initial leakage testing is completed, allow piping to remain pressurized with testing gas until testing agency performs final tests.
- Y. Penetrations:
  - 1. Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Completely fill and seal clearances between raceways and openings with the fire stopping material.

2. At floor penetrations, completely seal clearances around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.

### 3.3 TESTS

- A. Blow down, piping purge, and high and low pressure leakage tests shall be conducted as required by NFPA 99 for a level 3 compressed air system with documentation.
- B. Static pressure test, pressure relief test, cross connection test, alarm tests and test of secondary equipment shall be conducted for a level 3 compressed air system as required by current NFPA.

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**SECTION 22 62 19.74**  
**DENTAL VACUUM AND EVACUATION EQUIPMENT**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies central piped high volume oral evacuation (HVE) system for dental operatories, including piping, valving, vacuum producers, separators, electric motors, starters, controls and installation and start-up.

**1.2 RELATED WORK**

- A. Sealing around pipe penetrations to maintain the integrity of time rated construction: Section 07 84 00, FIRESTOPPING.
- B. Sealing around pipe penetrations through the floor to prevent moisture migration, Section 07 92 00, JOINT SEALANTS.
- C. Piping system identification: Section 09 91 00, PAINTING.
- D. General requirements and items common to more than one Section of Division 22: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- E. Valves (as required for water): Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING.
- F. Strainers (as required for water): Section 22 11 00, FACILITY WATER DISTRIBUTION.
- G. Electric Motors: Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT.
- H. Motor Starters: Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS.
- I. SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.  
Requirements for commissioning, systems readiness checklist, and training.

**1.3 QUALITY ASSURANCE**

- A. System: The minimum system demand shall be based on 3.3 L/s (7 scfm) per dental chair and at an operating pressure of 21 to 27 KPa (6 to 8 in Hg). A minimum of vacuum of 21 KPa (6 in - Hg) shall be maintained at the most distant outlet. System pressure drop shall be a maximum of 3 kPa (1 in - Hg) at the calculated demand flow.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Submit the following as one package:
  - 1. Piping
  - 3. Vacuum cleaning inlet
  - 4. Vacuum gage



- 7. Butterfly valve
- 8. Directional flow valve
- 9. Anti-surge valve
- 11. Separator Drainage Pump
- 12. Control Panel
- C. Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.

### 1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are in the text by the basic designation only.
- B. American National Standards Institute (ANSI):
  - A13.1- 07.....Scheme for the Identification of Piping System
  - B16.3-06 .....Malleable Iron Threaded Fittings Classes 150 and 300
  - B16.22-01.....Wrought Copper and Bronze Solder-Joint Pressure Fittings
  - B40.1-98..... Pressure Gauges and Gauge Attachments
- C. American Society for Testing and Materials (ASTM):
  - A47-99.....Ferritic Malleable Iron Castings
  - A53M-07 .....Pipe, Steel, Black Hot-Dipped, Zinc-Coated Welded and Seamless
  - A536-84 (2009) e1.....Ductile Iron Castings
  - B306- 09.....Copper Drainage Tube (DWV)
  - D1785 06 .....Poly (Vinyl Chloride) PVC Plastic Pipe Schedule 40, 80, 120
  - D2564 04.....Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
  - D2466 06 .....Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
  - D3311-09.....Drain, Waste, and Vent (DWV) Plastic Fittings
- D. National Fire Protection Association
  - NFPA 99c 2005 Edition.Level 3 Vacuum

## PART 2 - PRODUCTS

### 2.1 PIPING

- A. Poly (Vinyl Chloride) (PVC):
  - 1. PVC Piping: ASTM D1785-06, Type 1 (normal impact), Grade 1 (chemical resistance), Schedule 40 pipe. Provide socket ASTM D2566 fittings and

- ASTM D2564 PVC solvent cement with PVC primer recommended by manufacturer. Provide DWV (drain-waste-vent). Use long radius fittings for turns and wye fittings for branching, as defined in Section 22 13 00, FACILITY SANITARY SEWERAGE. Minimum pipe size for parts of distributing piping in or below slab is 50 millimeter (2").
- B. Galvanized Steel: Use only for discharge from vacuum producer, as per manufacturer's instructions.
1. Pipe: ASTM A53, standard weight.
  2. Fittings:
    - a. Flexible groove type, malleable iron, ASTM A47, or Ductile iron, ASTM A536.
    - b. Malleable iron screwed, ANSI B16.3.
- C. Cleanouts: Same size and material as pipe. Provide accessible and easily removable cleanouts as defined in Section 22 13 00, FACILITY SANITARY SEWERAGE
- D. Apply piping identification per ANSI A13.1.

### **2.3 VACUUM PRODUCER**

- A. The existing Duplex self-governing, multi-stage, centrifugal, turbine type of outboard design with bearings on both ends of the exhaustor shaft, maximum speed of 3600 rpm, two self-aligning radial bearings sealed with grease fitting or with oil-cup lubrication, connected to its driving motor by flexible coupling will remain in its current location and be piped to the relocated separators. Vacuum produced shall be substantially constant throughout the operating range.
- B.

### **2.4 CENTRAL SEPARATOR (DUPLEX)**

- A. Under the base bid the existing duplex central separators will be relocated to their new location in the basement of Building 9. Under the Alternate complete new duplex central separators will be provided in the basement of Building 9 as specified herein. Freestanding, bottom pitched to drain at low end, hot-dipped galvanized steel or fiberglass construction with smooth interior walls, and able to withstand a constant negative pressure of 61 kPa (18 inches mercury). Provide optional 360 degree solid state auto flush assembly, with positive protection against flush operation with vacuum producer running, solid-state high-low liquid sensor and corrosion resistant effluent pump to drain the tank. Adjust one tank to sense 90 percent and the other tank to sense 100 percent of its water capacity, to allow for non-simultaneous discharge and, therefore, uninterrupted HVE function to the clinical facility. Provide a sensor operated (120 VAC) Solenoid valve to control the outgoing airstream for adjustments between five and 180

seconds. Cold water supply to the autoflush unit shall contain an in-line filter equipped with 40-mesh stainless-steel screens. Provide a vacuum switch to prevent the wash down solenoid from operating when system is under a vacuum. Provide pressure reducing valve to maintain water pressure not to exceed 345 kPa (50 PSI).

## **2.5 VACUUM RELIEF VALVE (PROVIDE FOR BACKWARD CURVE IMPELLER DESIGN EXHAUSTERS)**

- A. Mechanically operated, placed at the end of each trunkline, to automatically sense negative pressure in the system to maintain movement of liquids through the piping system to the separator when inlet branches are closed. Valve connector shall be 13mm (0.5 inch NPT). Equip with a silencer to reduce air noise to below 85 decibels.

## **2.6 PIPE ISOLATORS**

- A. Flexible rubber, couple band, sealed clamps to isolate the turbine from the piping. Size coupling in accordance with the turbine's intake and output connections and provide steel coupling guards.

## **2.7 BUTTERFLY VALVE**

- A. Inlet: Built-in or located near the first stage of the turbine to prevent turbine overload through the operational range.
- B. Exhaust: Flanged, wafer-style, installed at exhauster output flange for equipment isolation.

## **2.8 DIRECTIONAL FLOW VALVE**

- A. Non-restrictive on turbine inlet to prevent back-flow of air.

## **2.9 ANTI-SURGE VALVE**

- A. Mechanically or electrically operated valve that will operate automatically throughout the turbine's designed range. Valve shall continually sense the negative pressure within the turbine and maintain a predetermined, operational level of kPa (inches-of-mercury) draw. Equip with a silencer to reduce air noise to below 85 decibels.

## **2.11 REPLACEMENT PARTS**

- A. Furnish a turbine bearings and coupling kit to include one set of turbine bearings and one complete motor/turbine flexible coupling, all of the same size and design as those supplied with the turbine.
- B. Provide complete installation instructions for repair kit items. //

## **2.13 SEPARATOR DRAIN AND VENT**

- A. Construct in accordance with NFPA 99c 2005 Edition, Level 3 Vacuum System Tank Drains and Tank Vents, paragraph 5.3.3.6.3.1 and 2.

## **2.15 VACUUM GAGE**

- A. In remote control panel: ANSI B40.1, 40mm (1-1/2 inch) dial with decorative ring.

- B. In piping near separator: ANSI B40.1, with metal case, 115mm (4-1/2 inch) dial.

## **2.16 PVC BODY BALL VALVES**

- A. PVC Body double-seal ball valves with replaceable neoprene or TFE seat seals. Provide valves suitable for at least 690 kPa (100 psig), cold water, non-shock working pressure. Design especially for vacuum service. Operating parts of valve shall be removable without removing from line.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Place vacuum producers on insulating pads furnished with the equipment. Do not bolt or anchor equipment to the floor slab.
- B. Cut pipe square, with burrs removed and install with minimum obstructions to air flow. Use DWV (drain-waste-vent) long-radius fittings for turns and wye type for branches.
- C. Slope horizontal piping not less than 1/4" per 10 ft (2mm per 1m) toward the separator tanks.
- D. All fittings shall be DWV (drain-waste-vent) long-radius bend types for turns and wye types for branching. For small bore piping for which long-radius bends are not available, two 45-degree bends shall be substituted for 90-degree turning.
- E. All risers to all HVE inlet locations shall be 40 mm (1.5 -inch) nominal pipe size. Risers shall connect to trunk lines whose nominal pipe sizes shall be determined by head loss calculations that yield a system designed for no more than 1.7 kPa (0.5 inches mercury) worse case head loss. Piping no smaller than 40 mm 1.5 inch shall be used.
- F. The cross-sectional area of all trunk lines shall be graduated, increasing toward the vacuum source. The cross-sectional area at any point along the trunk line shall equate to the sum of the riser cross-sectional areas connected prior to that point. Individual trunk lines shall terminate with connection to the manifold of the separators.
- G. If backward curve impeller design turbine is installed, terminate the most distant end from the separator of each trunk line with a vacuum relief valve.
- H. Install separators level and anchored to the floor slab.
- I. Start up shall be by factory representative.
- J. Penetrations:
  - 1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Completely fill and seal

- clearances between raceways and openings with the fire stopping material.
2. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.

### 3.2 TEST

- A. Pipe Leakage Test: Test in accordance with NFPA 99c, 2005 Edition, Paragraph 5.3.12.2.4. Exhaust complete piping system to a vacuum of not less than 27 kPa (8-inch mercury gage) after the pipe line is dried out initially. Vacuum shall not decrease by more than 1.4 kPa (0.4-inch mercury gage) in one hour. If the vacuum does not hold, repair the leaks and retest.
- B. Air Volume and Vacuum Tests:
  1. Tests shall confirm that the system will meet air volume and vacuum requirements at aspirator tips and that vacuum producer(s) will produce the total capacity required as specified in paragraph 1.3. Perform tests after all oral evacuation equipment is properly installed and piping is cleaned and proved tight.
  2. Install HVE (high volume evacuator) tips into the designed number of the facility's HVE (high volume evacuator) valves. Close all remaining HVE valves.
  3. With all UJC hoses fully closed, start the system. Fifteen minutes after start-up, measure the current draw of the motors with ammeter and record the reading of the vacuum gage. Fully open HVE valves with HVE tips in them and record the current and vacuum values again. Amperage measurements shall not exceed the motor full load amperage rating.
  4. Check entire system and insure the minimum flow stated in Paragraph 1.3 is achieved.
- C. The commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Resident Engineer and Commissioning Agent. Provide a minimum of 7 days prior to notice.

### 3.3 COMMISSIONING

- A. Provide commissioning documentation in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS for all inspection, startup, 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 22 08 00,

COMMISSIONING OF PLUMBING SYSTEMS and related sections for contractor responsibilities for system commissioning.

**3.4 DEMONSTRATION AND TRAINING**

- A. Provide services of manufacturer's technical representative for four hours to instruct VA Personnel in operation and maintenance of units.
- B. Submit training plans and instructor qualifications in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.

- - - E N D - - -

**SECTION 23 05 11  
COMMON WORK RESULTS FOR HVAC**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The requirements of this Section apply to all sections of Division 23.
- B. Definitions:
  - 1. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.
  - 2. Option or optional: Contractor's choice of an alternate material or method.
  - 3. RE: Resident Engineer
  - 4. COTR: Contracting Officer's Technical Representative.

**1.2 RELATED WORK**

- A. Section 00 72 00, GENERAL CONDITIONS
- B. Section 01 00 00, GENERAL REQUIREMENTS
- C. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES
- G. Section 03 30 00, CAST-IN-PLACE CONCRETE: Concrete and Grout
- J. Section 07 84 00, FIRESTOPPING
- K. Section 07 60 00, FLASHING AND SHEET METAL: Flashing for Wall and Roof Penetrations
- L. Section 07 92 00, JOINT SEALANTS
- M. Section 09 91 00, PAINTING
- O. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION
- P. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT
- Q. Section 23 05 93, TESTING, ADJUSTING, and BALANCING FOR HVAC
- R. Section 23 07 11, HVAC, PLUMBING, and Boiler Plant Insulation
- T. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC
- W. Section 23 21 13, HYDRONIC PIPING
- X. Section 23 21 23, HYDRONIC PUMPS
- Y. Section 23 22 13, STEAM and CONDENSATE HEATING PIPING
- BB. Section 23 25 00, HVAC WATER TREATMENT
- CC. Section 23 31 00, HVAC DUCTS and CASINGS
- DD. Section 23 34 00, HVAC FANS
- EE. Section 23 36 00, AIR TERMINAL UNITS
- FF. Section 23 37 00, AIR OUTLETS and INLETS
- HH. Section 23 40 00, HVAC AIR CLEANING DEVICES
- PP. Section 23 73 00, INDOOR CENTRAL-STATION AIR-HANDLING UNITS
- WW. Section 23 82 16, AIR COILS

- XX. Section 23 84 00, HUMIDITY CONTROL EQUIPMENT
- YY. Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS: Requirements for commissioning, systems readiness checklists, and training
- ZZ. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS
- AAA. Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS

### 1.3 QUALITY ASSURANCE

- A. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. The systems shall be comprised of high quality institutional-class and industrial-class products of manufacturers that are experienced specialists in the required product lines. All construction firms and personnel shall be experienced and qualified specialists in industrial and institutional HVAC
- B. Flow Rate Tolerance for HVAC Equipment: Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- C. Equipment Vibration Tolerance:
  - 1. Refer to Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT. Equipment shall be factory-balanced to this tolerance and re-balanced on site, as necessary.
  - 2. After HVAC air balance work is completed and permanent drive sheaves are in place, perform field mechanical balancing and adjustments required to meet the specified vibration tolerance.
- D. Products Criteria:
  - 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years (or longer as specified elsewhere). The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years. See other specification sections for any exceptions and/or additional requirements.
  - 2. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
  - 3. Conform to codes and standards as required by the specifications. Conform to local codes, if required by local authorities such as the



natural gas supplier, if the local codes are more stringent than those specified. Refer any conflicts to the Resident Engineer.

4. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
5. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
6. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
7. Asbestos products or equipment or materials containing asbestos shall not be used.

E. Equipment Service Organizations:

1. HVAC: Products and systems shall be supported by service organizations that maintain a complete inventory of repair parts and are located within 50 miles to the site.

F. HVAC Mechanical Systems Welding: Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:

1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
3. Certify that each welder has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.

G. Execution (Installation, Construction) Quality:

1. Apply and install all items in accordance with manufacturer's written instructions. Refer conflicts between the manufacturer's instructions and the contract drawings and specifications to the Resident Engineer for resolution. Provide written hard copies or computer files of manufacturer's installation instructions to the Resident Engineer at least two weeks prior to commencing installation of any item. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations is a cause for rejection of the material.
2. Provide complete layout drawings required by Paragraph, SUBMITTALS. Do not commence construction work on any system until the layout drawings have been approved.

- H. Upon request by Government, provide lists of previous installations for selected items of equipment. Include contact persons who will serve as references, with telephone numbers and e-mail addresses.

#### **1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, and with requirements in the individual specification sections.
- B. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.
- C. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- D. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- E. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient.
- H. Layout Drawings:
  - 1. Submit complete consolidated and coordinated layout drawings for all new systems, and for existing systems that are in the same areas. Refer to Section 00 72 00, GENERAL CONDITIONS, Article, SUBCONTRACTS AND WORK COORDINATION.
  - 2. The drawings shall include plan views, elevations and sections of all systems and shall be on a scale of not less than 1:32 (3/8-inch equal to one foot). Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show locations and adequate clearance for all equipment, piping, valves, control panels and other items. Show the access means for all items requiring access for operations and maintenance. Provide detailed layout drawings of all piping and duct systems.
  - 3. Do not install equipment foundations, equipment or piping until layout drawings have been approved.
  - 4. In addition, for HVAC systems, provide details of the following:

- a. Mechanical equipment rooms.
  - b. Interstitial space.
  - c. Hangers, inserts, supports, and bracing.
  - d. Pipe sleeves.
  - e. Duct or equipment penetrations of floors, walls, ceilings, or roofs.
- I. Manufacturer's Literature and Data: Submit under the pertinent section rather than under this section.
- 1. Submit belt drive with the driven equipment. Submit selection data for specific drives when requested by the Resident Engineer.
  - 2. Submit electric motor data and variable speed drive data with the driven equipment.
  - 3. Equipment and materials identification.
  - 4. Fire-stopping materials.
  - 5. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
  - 6. Wall, floor, and ceiling plates.
- J. HVAC Maintenance Data and Operating Instructions:
- 1. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment.
  - 2. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment. Include in the listing belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.
- K. Provide copies of approved HVAC equipment submittals to the Testing, Adjusting and Balancing Subcontractor.

#### **1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Air Conditioning, Heating and Refrigeration Institute (AHRI):  
430-2009.....Central Station Air-Handling Units
- C. American National Standard Institute (ANSI):  
B31.1-2007.....Power Piping
- D. Rubber Manufacturers Association (ANSI/RMA):  
IP-20-2007.....Specifications for Drives Using Classical  
V-Belts and Sheaves  
IP-21-2009.....Specifications for Drives Using Double-V  
(Hexagonal) Belts

- IP-22-2007.....Specifications for Drives Using Narrow V-Belts  
and Sheaves
- E. Air Movement and Control Association (AMCA):
- 410-96.....Recommended Safety Practices for Air Moving  
Devices
- F. American Society of Mechanical Engineers (ASME):
- Boiler and Pressure Vessel Code (BPVC):
- Section I-2007.....Power Boilers
- Section IX-2007.....Welding and Brazing Qualifications
- Code for Pressure Piping:
- B31.1-2007.....Power Piping
- G. American Society for Testing and Materials (ASTM):
- A36/A36M-08.....Standard Specification for Carbon Structural  
Steel
- A575-96(2007).....Standard Specification for Steel Bars, Carbon,  
Merchant Quality, M-Grades
- E84-10.....Standard Test Method for Surface Burning  
Characteristics of Building Materials
- E119-09c.....Standard Test Methods for Fire Tests of Building  
Construction and Materials
- H. Manufacturers Standardization Society (MSS) of the Valve and Fittings  
Industry, Inc:
- SP-58-2009.....Pipe Hangers and Supports-Materials, Design and  
Manufacture, Selection, Application, and  
Installation
- SP 69-2003.....Pipe Hangers and Supports-Selection and  
Application
- SP 127-2001.....Bracing for Piping Systems, Seismic - Wind -  
Dynamic, Design, Selection, Application
- I. National Electrical Manufacturers Association (NEMA):
- MG-1-2009.....Motors and Generators
- J. National Fire Protection Association (NFPA):
- 70-08.....National Electrical Code
- 90A-09.....Standard for the Installation of Air  
Conditioning and Ventilating Systems
- 101-09.....Life Safety Code

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

##### **A. Protection of Equipment:**

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and

- material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
2. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Resident Engineer. Such repair or replacement shall be at no additional cost to the Government.
  3. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
  4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
- B. Cleanliness of Piping and Equipment Systems:
1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
  2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
  3. Clean interior of all tanks prior to delivery for beneficial use by the Government.
  4. Boilers shall be left clean following final internal inspection by Government insurance representative or inspector.
  5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

#### **1.7 JOB CONDITIONS - WORK IN EXISTING BUILDING**

- A. Building Operation: Government employees will be continuously operating and managing all facilities, including temporary facilities, that serve the medical center.
- B. Maintenance of Service: Schedule all work to permit continuous service as required by the medical center.
- C. Steam and Condensate Service Interruptions: Limited steam and condensate service interruptions, as required for interconnections of new and existing systems, will be permitted by the Resident Engineer during periods when the demands are not critical to the operation of the medical center. These non-critical periods are limited to between 8 pm and 5 am in the appropriate off-season (if applicable). Provide at least one week advance notice to the Resident Engineer.
- D. Phasing of Work: Comply with all requirements shown on drawings or specified.
- E. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times.

Maintain the interior of building at 18 degrees C (65 degrees F) minimum. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. No storm water or ground water leakage permitted. Provide daily clean-up of construction and demolition debris on all floor surfaces and on all equipment being operated by VA.

F. Acceptance of Work for Government Operation: As new facilities are made available for operation and these facilities are of beneficial use to the Government, inspections will be made and tests will be performed. Based on the inspections, a list of contract deficiencies will be issued to the Contractor. After correction of deficiencies as necessary for beneficial use, the Contracting Officer will process necessary acceptance and the equipment will then be under the control and operation of Government personnel.

G. Temporary Facilities: Refer to Article, TEMPORARY PIPING AND EQUIPMENT in this section.

## **PART 2 - PRODUCTS**

### **2.1 FACTORY-ASSEMBLED PRODUCTS**

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
  - 1. All components of an assembled unit need not be products of same manufacturer.
  - 2. Constituent parts that are alike shall be products of a single manufacturer.
  - 3. Components shall be compatible with each other and with the total assembly for intended service.
  - 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

### **2.2 COMPATIBILITY OF RELATED EQUIPMENT**

Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the

result will be a complete and fully operational plant that conforms to contract requirements.

### **2.3 BELT DRIVES**

- A. Type: ANSI/RMA standard V-belts with proper motor pulley and driven sheave. Belts shall be constructed of reinforced cord and rubber.
- B. Dimensions, rating and selection standards: ANSI/RMA IP-20 and IP-21.
- C. Minimum Horsepower Rating: Motor horsepower plus recommended ANSI/RMA service factor (not less than 20 percent) in addition to the ANSI/RMA allowances for pitch diameter, center distance, and arc of contact.
- D. Maximum Speed: 25 m/s (5000 feet per minute).
- E. Adjustment Provisions: For alignment and ANSI/RMA standard allowances for installation and take-up.
- F. Drives may utilize a single V-Belt (any cross section) when it is the manufacturer's standard.
- G. Multiple Belts: Matched to ANSI/RMA specified limits by measurement on a belt measuring fixture. Seal matched sets together to prevent mixing or partial loss of sets. Replacement, when necessary, shall be an entire set of new matched belts.
- H. Sheaves and Pulleys:
  - 1. Material: Pressed steel, or close grained cast iron.
  - 2. Bore: Fixed or bushing type for securing to shaft with keys.
  - 3. Balanced: Statically and dynamically.
  - 4. Groove spacing for driving and driven pulleys shall be the same.
- I. Drive Types, Based on ARI 435:
  - 1. Provide adjustable-pitch or fixed-pitch drive as follows:
    - a. Fan speeds up to 1800 RPM: 7.5 kW (10 horsepower) and smaller.
    - b. Fan speeds over 1800 RPM: 2.2 kW (3 horsepower) and smaller.
  - 2. Provide fixed-pitch drives for drives larger than those listed above.
  - 3. The final fan speeds required to just meet the system CFM and pressure requirements, without throttling, shall be determined by adjustment of a temporary adjustable-pitch motor sheave or by fan law calculation if a fixed-pitch drive is used initially.

### **2.4 DRIVE GUARDS**

- A. For machinery and equipment, provide guards as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears and other moving parts regardless of height above the floor to prevent damage to equipment and injury to personnel. Drive guards may be excluded where motors and drives are inside factory fabricated air handling unit casings.
- B. Pump shafts and couplings shall be fully guarded by a sheet steel guard, covering coupling and shaft but not bearings. Material shall be minimum

16-gage sheet steel; ends shall be braked and drilled and attached to pump base with minimum of four 6 mm (1/4-inch) bolts. Reinforce guard as necessary to prevent side play forcing guard onto couplings.

- C. V-belt and sheave assemblies shall be totally enclosed, firmly mounted, non-resonant. Guard shall be an assembly of minimum 22-gage sheet steel and expanded or perforated metal to permit observation of belts. 25 mm (one-inch) diameter hole shall be provided at each shaft centerline to permit speed measurement.
- D. Materials: Sheet steel, cast iron, expanded metal or wire mesh rigidly secured so as to be removable without disassembling pipe, duct, or electrical connections to equipment.
- E. Access for Speed Measurement: 25 mm (One inch) diameter hole at each shaft center.

## **2.5 LIFTING ATTACHMENTS**

Provide equipment with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

## **2.6 ELECTRIC MOTORS**

- A. All material and equipment furnished and installation methods shall conform to the requirements of Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT; Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS; and, Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW). Provide all electrical wiring, conduit, and devices necessary for the proper connection, protection and operation of the systems. Provide special energy efficient premium efficiency type motors as scheduled.

## **2.7 VARIABLE SPEED MOTOR CONTROLLERS**

- A. Refer to Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS and Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS for specifications.
- B. The combination of controller and motor shall be provided by the manufacturer of the driven equipment, such as pumps and fans, and shall be rated for 100 percent output performance. Multiple units of the same class of equipment, i.e. air handlers, fans, pumps, shall be product of a single manufacturer.
- C. Motors shall be premium efficiency type and be approved by the motor controller manufacturer. The controller-motor combination shall be guaranteed to provide full motor nameplate horsepower in variable frequency operation. Both driving and driven motor/fan sheaves shall be fixed pitch.



- D. Controller shall not add any current or voltage transients to the input AC power distribution system, DDC controls, sensitive medical equipment, etc., nor shall be affected from other devices on the AC power system.
- E. Controller shall be provided with the following operating features and accessories:
  - 1. Suitable for variable torque load.
  - 2. Provide thermal magnetic circuit breaker or fused switch with external operator and incoming line fuses. Unit shall be rated for minimum 25,000 AIC. Provide AC input line reactors (3% impedance) filters on incoming power line. Provide output line reactors on line between drive and motor for motors over 50 HP or where the distance between the breaker and motor exceeds 50 feet.

## **2.8 EQUIPMENT AND MATERIALS IDENTIFICATION**

- A. Use symbols, nomenclature and equipment numbers specified, shown on the drawings and shown in the maintenance manuals. Identification for piping is specified in Section 09 91 00, PAINTING.
- B. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 48 mm (3/16-inch) high of brass with black-filled letters, or rigid black plastic with white letters specified in Section 09 91 00, PAINTING permanently fastened to the equipment. Identify unit components such as coils, filters, fans, etc.
- C. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 48 mm (3/16-inch) high riveted or bolted to the equipment.
- D. Control Items: Label all temperature and humidity sensors, controllers and control dampers. Identify and label each item as they appear on the control diagrams.
- E. Valve Tags and Lists:
  - 1. HVAC and Boiler Plant: Provide for all valves other than for equipment in Section 23 82 00, CONVECTION HEATING AND COOLING UNITS.
  - 2. Valve tags: Engraved black filled numbers and letters not less than 13 mm (1/2-inch) high for number designation, and not less than 6.4 mm (1/4-inch) for service designation on 19 gage 38 mm (1-1/2 inches) round brass disc, attached with brass "S" hook or brass chain.
  - 3. Valve lists: Typed or printed plastic coated card(s), sized 216 mm (8-1/2 inches) by 280 mm (11 inches) showing tag number, valve function and area of control, for each service or system. Punch sheets for a 3-ring notebook.
  - 4. Provide detailed plan for each floor of the building indicating the location and valve number for each valve. Identify location of each valve with a color coded thumb tack in ceiling.

## 2.9 FIRESTOPPING

Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping and ductwork. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION, for firestop pipe and duct insulation.

## 2.10 GALVANIZED REPAIR COMPOUND

Mil. Spec. DOD-P-21035B, paint form.

## 2.11 HVAC PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. Vibration Isolators: Refer to Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.
- C. Pipe Supports: Comply with MSS SP-58. Type Numbers specified refer to this standard. For selection and application comply with MSS SP-69. Refer to Section 05 50 00, METAL FABRICATIONS, for miscellaneous metal support materials and prime coat painting requirements.
- D. Attachment to Concrete Building Construction:
  - 1. Concrete insert: MSS SP-58, Type 18.
  - 2. Self-drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 102 mm (four inches) thick when approved by the Resident Engineer for each job condition.
  - 3. Power-driven fasteners: Permitted in existing concrete or masonry not less than 102 mm (four inches) thick when approved by the Resident Engineer for each job condition.
- E. Attachment to Steel Building Construction:
  - 1. Welded attachment: MSS SP-58, Type 22.
  - 2. Beam clamps: MSS SP-58, Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 23mm (7/8-inch) outside diameter.
- G. Attachment to existing structure: Support from existing floor/roof frame.
- H. Attachment to Wood Construction: Wood screws or lag bolts.
- I. Hanger Rods: Hot-rolled steel, ASTM A36 or A575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn-buckles shall provide 38 mm (1-1/2 inches) minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.
- J. Hangers Supporting Multiple Pipes (Trapeze Hangers): Galvanized, cold formed, lipped steel channel horizontal member, not less than 41 mm by 41 mm (1-5/8 inches by 1-5/8 inches), 2.7 mm (No. 12 gage), designed to accept special spring held, hardened steel nuts. Not permitted for steam supply and condensate piping.

1. Allowable hanger load: Manufacturers rating less 91kg (200 pounds).
2. Guide individual pipes on the horizontal member of every other trapeze hanger with 6 mm (1/4-inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 13mm (1/2-inch) galvanized steel bands, or preinsulated calcium silicate shield for insulated piping at each hanger.

K. Supports for Piping Systems:

1. Select hangers sized to encircle insulation on insulated piping. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports or preinsulated calcium silicate shields. Provide Type 40 insulation shield or preinsulated calcium silicate shield at all other types of supports and hangers including those for preinsulated piping.
2. Piping Systems except High and Medium Pressure Steam (MSS SP-58):
  - a. Standard clevis hanger: Type 1; provide locknut.
  - b. Riser clamps: Type 8.
  - c. Wall brackets: Types 31, 32 or 33.
  - d. Roller supports: Type 41, 43, 44 and 46.
  - e. Saddle support: Type 36, 37 or 38.
  - f. Turnbuckle: Types 13 or 15. Preinsulate.
  - g. U-bolt clamp: Type 24.
  - h. Copper Tube:
    - 1) Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, plastic coated or taped with non adhesive isolation tape to prevent electrolysis.
    - 2) For vertical runs use epoxy painted or plastic coated riser clamps.
    - 3) For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
    - 4) Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.
  - i. Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp.
3. High and Medium Pressure Steam (MSS SP-58):
  - a. Provide eye rod or Type 17 eye nut near the upper attachment.
  - b. Piping 50 mm (2 inches) and larger: Type 43 roller hanger. For roller hangers requiring seismic bracing provide a Type 1 clevis hanger with Type 41 roller attached by flat side bars.

4. Convertor and Expansion Tank Hangers: May be Type 1 sized for the shell diameter. Insulation where required will cover the hangers.
- L. Pre-insulated Calcium Silicate Shields:
  1. Provide 360 degree water resistant high density 965 kPa (140 psi) compressive strength calcium silicate shields encased in galvanized metal.
  2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
  3. Shield thickness shall match the pipe insulation.
  4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
    - a. Shields for supporting chilled or cold water shall have insulation that extends a minimum of 1 inch past the sheet metal. Provide for an adequate vapor barrier in chilled lines.
    - b. The pre-insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS-SP 69. To support the load, the shields may have one or more of the following features: structural inserts 4138 kPa (600 psi) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36) wear plates welded to the bottom sheet metal jacket.
  5. Shields may be used on steel clevis hanger type supports, roller supports or flat surfaces.

## **2.12 PIPE PENETRATIONS**

- A. Install sleeves during construction for other than blocked out floor openings for risers in mechanical bays.
- B. To prevent accidental liquid spills from passing to a lower level, provide the following:
  1. For sleeves: Extend sleeve 25 mm (one inch) above finished floor and provide sealant for watertight joint.
  2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
  3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.
- C. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from these requirements must receive prior approval of Resident Engineer.
- D. Sheet Metal, Plastic, or Moisture-resistant Fiber Sleeves: Provide for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.