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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 VENTILATION UPGRADES WEST WING as required by drawings and specifications.

B. Visits to the site by Bidders may be made only by appointment with the Medical Center Contracting Officer's Technical Representative (COTR).

C. Offices of A/E NAME, as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.

D. Before placement and installation of work subject to tests by testing laboratory retained by Department of Veterans Affairs, the Contractor shall notify the COTR in sufficient time to enable testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the COTR.

E. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.

F. Prior to commencing work, general contractor shall provide proof that a OSHA certified "competent person" (CP) (29 CFR 1926.20(b)(2) will maintain a presence at the work site whenever the general or subcontractors are present:

1. Contractor must have full-time superintendent on site with 30-hour OSHA certified construction safety course.

G. Training:

1. All employees of general contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by VA CP with input from the ICRA team.
2. Submit training records of all such employees for approval before the start of work.
3. Full Time Superintendent to have 30-Hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by VA CP with input from the ICRA team.

1.2 STATEMENT OF BID ITEM(S)

A. ITEM I, GENERAL CONSTRUCTION: VENTILATION UPGRADES WEST WING: Work includes general construction, alterations, mechanical and electrical work, necessary removal of existing structures and construction and certain other items.

B. ALTERNATE NO.1: Optional

1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

A. AFTER AWARD OF CONTRACT, 1 set of specifications and drawings will be furnished. These drawings and specifications will consist of those returned by prospective bidders.

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

1.4 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Plan:

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

B. Security Procedures:

1. General Contractor’s employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
2. For working outside the “regular hours” as defined in the contract, The General Contractor shall give 3 days notice to the Contracting Officer so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. VA reserves the right to close down or shut down the project site and order General Contractor’s employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Guards:

1. The General Contractor shall provide unarmed guards at the project site after construction hours.

2. The guard shall have communication devices to report events as directed by VA police.
3. The general Contractor shall install equipment for recording guard rounds to ensure systematic checking of the premises.

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

E. Document Control:
1. 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.

F. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. Separate permits shall not be issued for General Contractor and its employees for parking in designated areas only.

1.5 FIRE SAFETY

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

1. American Society for Testing and Materials (ASTM):
   E84-2009.....Surface Burning Characteristics of Building Materials
2. National Fire Protection Association (NFPA):
   10-2010.....Standard for Portable Fire Extinguishers
   30-2008.....Flammable and Combustible Liquids Code
   51B-2009.....Standard for Fire Prevention During Welding, Cutting and Other Hot Work
   70-2011.....National Electrical Code
   241-2009.....Standard for Safeguarding Construction, Alteration, and Demolition Operations
3. Occupational Safety and Health Administration (OSHA):
   29 CFR 1926.....Safety and Health Regulations for Construction

B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to COTR and Facility Safety Officer for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the general contractor’s competent person per OSHA requirements. This briefing shall include information on the construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, etc. Documentation shall be provided to the COTR that individuals have undergone contractor’s safety briefing.

C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.

D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).

E. Temporary Construction Partitions:

1. Install and maintain temporary construction partitions to provide smoke-tight separations between the areas that are described in phasing requirements. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
2. Install two-hour, fire-rated, temporary construction partitions as shown on drawings to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.
3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.

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

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

H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. GC is to report findings and corrective actions weekly to COTR and facility Safety Officer.

I. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.

J. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.

K. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers.

L. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request

interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with COTR and facility Safety Officer. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the COTR.

M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with COTR and facility Safety Officer.

N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COTR. Obtain permits from facility Safety Officer at least 24 hours in advance.

O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COTR and facility Safety Officer.

P. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.

Q. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.

R. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.

S. If required, submit documentation to the COTR that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

1.6 OPERATIONS AND STORAGE AREAS

A. The Contractor shall confine all operations (including storage of materials) on Government premises to designated construction area only. There will be no outside staging areas. 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. The amount of construction being done at one time; has caused the existence of storage/Lay-Down Areas improbable. However, Working space and space available for storing materials shall be as determined by the COTR.

C. 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.

D. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

(FAR 52.236-10)

E. Working space and space available for storing materials shall be as determined by the COTR.

F. Workers are subject to rules of Medical Center applicable to their conduct.

G. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by COTR where required by limited working space.

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

H. Phasing: To ensure such executions, Contractor shall furnish the COTR with a schedule of approximate phasing and dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. In addition, Contractor shall notify the

COTR two weeks in advance of the proposed date of starting work in each specific area of site, building or portion thereof. Arrange such phasing and dates to ensure accomplishment of this work in successive phases mutually agreeable to Medical Center Director, COTR and Contractor, as follows:

PHASING PLAN OPTIONAL

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

2. Immediate areas of alterations not mentioned in preceding Subparagraph 1 will be temporarily vacated while alterations are performed.

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

1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of COTR. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without the Medical Center Director’s prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS for additional requirements.
2. Contractor shall submit a request to interrupt any such services to COTR, in writing, 48 hours in advance of proposed interruption.

Request shall state reason, date, exact time of, and approximate duration of such interruption.

3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COTR.
5. In case of a contract construction emergency, service will be interrupted on approval of COTR. Such approval will be confirmed in writing as soon as practical.
6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.

K. 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.

L. 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.

M. Coordinate the work for this contract with other construction operations as directed by COTR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

1.7 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 COTR and Facility ICRA team for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

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

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

1. The COTR and VAMC Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in the patient-care rooms are appropriate for their settings. The requirement for negative air pressure in the construction zone shall depend on the location and type of activity. Upon notification, the contractor shall implement corrective measures to restore proper pressure differentials as needed.
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 COTR. GC to blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.
2. Do not perform dust producing tasks within occupied areas without the approval of the COTR. For construction in any areas that will remain jointly occupied by the medical Center and Contractor’s workers, the Contractor shall:
   a. Provide dust proof two-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

polyethylene, 6-mil thick or greater plastic barrier meeting local fire codes may be used where dust control is the only hazard, and an agreement is reached with the COTR and Medical Center.

b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.

c. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm (24” x 36”), shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.

d. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as they are created. Transport these outside the construction area in containers with tightly fitting lids.

e. The contractor shall not haul debris through patient-care areas without prior approval of the COTR and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.

f. Using a HEPA vacuum, clean inside the barrier and vacuum ceiling tile prior to replacement. Any ceiling access panels opened for investigation beyond sealed areas shall be sealed immediately when unattended.

g. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up

and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.

h. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

E. Final Cleanup:

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

1.8 DISPOSAL AND RETENTION

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

1. Reserved items which are to remain property of the Government are identified by attached tags as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by COTR.
2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center
3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.

1.9 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.

(FAR 52.236-9)

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

D. Refer to FAR clause 52.236-7, "Permits and Responsibilities," which is included in General Conditions. A National Pollutant Discharge Elimination System (NPDES) permit is required for this project. The Contractor is considered an "operator" under the permit and has extensive responsibility for compliance with permit requirements. VA will make the permit application available at the (appropriate medical center) office. The apparent low bidder, contractor and affected subcontractors shall furnish all information and certifications that are required to comply with the permit process and permit requirements. Many of the permit requirements will be satisfied by completing construction as shown and specified. Some requirements involve the Contractor's method of operations and operations planning and the Contractor is responsible for employing best management practices. The affected activities often include, but are not limited to the following:

- Designating areas for equipment maintenance and repair;
- Providing waste receptacles at convenient locations and provide regular collection of wastes;
- Locating equipment wash down areas on site, and provide appropriate control of wash-waters;
- Providing protected storage areas for chemicals, paints, solvents, fertilizers, and other potentially toxic materials; and

- Providing adequately maintained sanitary facilities.

1.10 RESTORATION

A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the COTR. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the COTR before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.

B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.

C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are indicated on drawings and which are not scheduled for discontinuance or abandonment.

D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.11 AS-BUILT DRAWINGS

A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.

B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the COTR's review, as often as requested.

C. Contractor shall deliver two approved completed sets of as-built drawings to the COTR within 15 calendar days after each completed phase and after the acceptance of the project by the COTR.

D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.12 USE OF ROADWAYS

A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the COTR, such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.

B. When new permanent roads are to be a part of this contract, Contractor may construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.

C. When certain buildings (or parts of certain buildings) are required to be completed in advance of general date of completion, all roads leading thereto must be completed and available for use at time set for completion of such buildings or parts thereof.

1.13 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to compliance with the following provisions:

1. Permission to use each unit or system must be given by COTR. If the equipment is not installed and maintained in accordance with the following provisions, the COTR will withdraw permission for use of the equipment.
2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced

at completion of construction and prior to testing and balancing of system.

6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government.

B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.

C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.

1.14 TEMPORARY USE OF EXISTING ELEVATORS

A. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:

1. Contractor makes all arrangements with the COTR for use of elevators. The COTR will ascertain that elevators are in proper condition. Contractor may use elevators as designated by COTR in Building Number 1 for daily use. Personnel for operating elevators will not be provided by the Department of Veterans Affairs.
2. Contractor covers and provides maximum protection of following elevator components:
   a. Entrance jambs, heads soffits and threshold plates.
   b. Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
   c. Finish flooring.
3. Government will accept hoisting ropes of elevator and rope of each speed governor if they are worn under normal operation. However, if these ropes are damaged by action of foreign matter such as sand, lime, grit, stones, etc., during temporary use, they shall be removed and replaced by new hoisting ropes.
4. If brake lining of elevators are excessively worn or damaged during temporary use, they shall be removed and replaced by new brake lining.
5. All parts of main controller, starter, relay panel, selector, etc., worn or damaged during temporary use shall be removed and replaced with new parts, if recommended by elevator inspector after elevator is released by Contractor.

6. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer.

1.15 AVAILABILITY AND USE OF UTILITY SERVICES

A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.

B. The Contractor, at Contractor's expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

C. Contractor shall install meters at Contractor's expense and furnish the Medical Center a monthly record of the Contractor's usage of electricity as hereinafter specified.

D. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:

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

   a. Steam is available at no cost to Contractor.

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

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

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

1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection. Water is available at no cost to the Contractor.
2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes

will be cause for revocation (at COTR's discretion) of use of water from Medical Center's system.

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

1. Obtain steam for testing by connecting to the Medical Centersteam 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 COTR's discretion), of use of steam from the Medical Center's system.

H. 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.

1.16 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.

1.17 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.

1.18 INSTRUCTIONS

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

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

C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions

for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the COTR and shall be considered concluded only when the COTR is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COTR, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.19 CONSTRUCTION SIGN

A. Provide a Construction Sign where directed by the COTR. All wood members shall be of framing lumber. Cover sign frame with 0.7 mm (24 gage) galvanized sheet steel nailed securely around edges and on all bearings. Provide three 100 by 100 mm (4 inch by 4 inch) posts (or equivalent round posts) set 1200 mm (four feet) into ground. Set bottom of sign level at 900 mm (three feet) above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with 50 x 100 mm (two by four inch) material as directed.

B. Paint all surfaces of sign and posts two coats of white gloss paint. Border and letters shall be of black gloss paint, except project title which shall be blue gloss paint.

C. Maintain sign and remove it when directed by the COTR.

D. Detail Drawing of construction sign showing required legend and other characteristics of sign is attached hereto and made a part of this specification.

1.20 SAFETY SIGN

A. Provide a Safety Sign where directed by COTR. Face of sign shall be 19 mm (3/4 inch) thick exterior grade plywood. Provide two 100 mm by 100 mm (four by four inch) posts extending full height of sign and 900 mm (three feet) into ground. Set bottom of sign level at 1200 mm (four feet) above ground.

B. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with gloss paint of colors noted.

C. Maintain sign and remove it when directed by COTR.

D. Standard Detail Drawing Number SD10000-02(Found on VA TIL) of safety sign showing required legend and other characteristics of sign is attached hereto and is made a part of this specification.

E. Post the number of accident free days on a daily basis.

1.21 HISTORIC PRESERVATION

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

1.22 ATTACHMENTS

A. Preconstruction Risk Assessment for Construction Compliance
B. VHA Directive 2011-036: Safety and Health During Construction

- - - E N D - - -

SECTION 01 01 10
MEDICAL CENTER REQUIREMENTS

PART 1 GENERAL

1.0 GENERAL INTENTION: This section pertains to station policy for construction projects performed at the VA Pittsburgh Health Care System. Safety and health concerns are taken seriously. Both our staff and yours are expected to strictly adhere to the regulations and requirements. This is exceedingly important, since we must be primarily concerned for the safety of our patients. In this regard, OSHA Standards may protect worker safety and health, but they have minimal benefit for protecting the safety and health of our patients, due primarily to their differing medical conditions. Review this information as orientation with your personnel performing work on site. Where the requirements as outlined in this and other specification sections are differing, the more stringent and beneficial to the VA Pittsburgh Healthcare System shall apply.

1.1 RELATED SPECIFICATIONS:

01 00 00 – General Requirements
01 74 19 – Construction Waste Management
01 57 19 – Temporary Environmental Controls

2.0 REQUIREMENTS

A. Security:
   1. Secure all construction areas, especially mechanical and electrical rooms against entry of unauthorized individuals including patients.
   2. Notify the COR for permission to work after hours and weekends. Standard work hours for the medical center are Monday – Friday, 7:00 a.m. to 4:30 p.m.
   3. All contractors will wear and display VA contractor badges provided by the VA Police Department.
B. Key Security:
   1. Only a limited number of keys will be issued to the contractor.
   2. If the Contractor loses a key, notify the COR immediately. All areas that are to be re-keyed due to the lost key will be at Contractor's expense at a charge of $50 per key and $50 per change. All new keys required to be issued will be completed at the Contractor's expense.
   3. Ensure all doors leading to and from the construction areas are locked at all times to prevent access to the area from unauthorized persons. The Contractor's keys will be removed if they fail to comply with security requirements.
C. General Safety:
   1. Follow all federal, state and local safety and health regulations.
   2. Maintain safety in the construction site/area in accordance with the provisions of the contract, which includes the OSHA Regulations, National Electrical Codes. NFPA 70, National Electric Code and NFPA 101, Life Safety Code. Work in a safe manner and take all proper precautions while performing your work. Extra precautions shall be taken when working around persons occupying the building during construction.
   3. Provide Personal Preventive Equipment (PPE) for your employees.
   4. Post appropriate signs in specific hazardous areas. Contractor to post construction warning signs at each entrance to area.
   5. Keep tools, ladders, etc. away from patients to prevent injuries.
D. Safety or Environmental Violations and Experience Modification Rate
   1. The professional Occupational Safety & Health staff at this facility will perform Safety inspections of all contract operations. Written reports of unsafe practices or conditions will be reported to the Contracting Officers Technical

Representative (COR) and Contracting Officer for immediate attention and resolution.

2. All Bidders/Offerors shall submit the following information pertaining to their past Safety and Environmental record. The information shall contain, at a minimum, a certification that the bidder/offeror has no more than three (3) serious, or one (1) repeat or one (1) willful OSHA or any EPA violation(s) in the past three years.
3. All Bidders/Offerors shall submit information regarding their current Experience Modification Rate (EMR) equal to or less than 1.0. This information shall be obtained from the bidder's/offeror's insurance company and be furnished on the insurance carrier's letterhead.
4. Self-insured contractors or other contractors that cannot provide their EMR rating on insurance letterhead must obtain a rating from the National Council on Compensation Insurance, Inc. (NCCI) by completing/submitting form ERM-6 and providing the rating on letterhead from NCCI. Note: Self-insured contractors or other contractors that cannot provide EMR rating on insurance letterhead from the states or territories of CA, DE, MI, NJ, ND, OH, PA, WA, WY, and PR shall obtain their EMR rating from their state run worker's compensation insurance rating bureau.
5. A *Determination of Responsibility* will be accomplished for the apparent awardee prior to processing the award. The above information, along with other information obtained from Government systems, such as the OSHA and EPA online inspection history databases will be used to make the *Determination of Responsibility*. Failure to affirm being within the guidelines above or submit this information will result in a determination of "Non-Responsibility" for the bidder/offeror. NOTE: Any information received by the Government that would cause for a negative *Determination of Responsibility* will make the bidder/offeror ineligible for award.
6. This requirement is applicable to all subcontracting tiers, and prospective prime contractors are responsible for determining the responsibility of their prospective subcontractors.

E. Safety Inspections:
1. The professional Occupational Safety & Health staff at this facility will perform Safety inspections of all contract operations. Written reports of unsafe practices or conditions will be reported to the Contracting Officers Representative (COR) and Contracting Officer for immediate attention and resolution.

F. Fire Alarms:
1. The fire alarm system connects all buildings at this facility, and is activated by various heat, duct, manual pull stations, and smoke sensors. Manual pull stations are provided at each entrance. Please survey the area in which you are working to locate the manual pull stations.
2. If in the event of a fire alarm sounding, you are to remain in your area, unless medical center personnel (Safety, Nursing or Engineering) instruct otherwise or unless a fire situation is in your area, in which case you should immediately evacuate.
3. Any work involving the fire protection systems will require written permission to proceed from the COR. Do not tamper with or otherwise disturb any fire alarm system components without prior written permission. To do so without written permission will result in an adverse action.

G. Hazardous Materials:
1. Many of the operations you are scheduled to perform may involve the use of hazardous materials prior to bringing hazardous materials on site, all Material Safety Data Sheets will be submitted through the COR for evaluation by the facilities Industrial Hygienist/Safety Representative.
2. Storage of hazardous materials within buildings will be minimal with only enough on hand to perform daily work tasks. Flammable materials will either be removed from buildings at the end of the work shift or stored in approved flammable

storage containers.

3. Care must be taken to assure adequate ventilation to remove vapors of hazardous materials in use. Many of the patients being cared for in the facility are susceptible to environmental contaminants, even when odors seem minimal. You will isolate those areas where vapors are produced and ventilate to the most extent possible to reduce the number of complaints.
4. When chemicals become odorous, the Safety Office should be contacted immediately, i.e., adhesive remover used to remove glue, so employees in adjacent areas can be notified.

H. Airborne Dust Control During Construction:

1. Generation of dust is of major concern within staff and especially in-patient occupied buildings. Where operations involve the generation of dust, all efforts will be directed at reducing airborne generated dust to the lowest level feasible. This may be accomplished by a number of methods. These include misting the area with water, or use of tools attached to high efficiency particulate air (HEPA) filtering vacuums.
2. Classification of Jobs – See COR for ICRA Policy(EC-043 and EC-051)

I. Contact with Asbestos Containing Materials:

1. Due to the age of our buildings, many contain asbestos containing materials (ACM). Primary ACM uses in the medical center include floor tile, mastic, piping and HVAC insulation. The medical center has performed a comprehensive asbestos survey and has identified accessible ACM. Some areas contain damaged asbestos and should not be accessed without prior abatement.
2. The most common type of ACM insulation you may encounter includes thermal system insulation (TSI) and vinyl asbestos tile floor (VAT). ACM TSI is generally covered with a cloth wrap or lagging and the asbestos substrate generally appear white in color. Do not sand, Drill, Gouge, or otherwise disturb this type of insulation. Contractors disturbing or releasing asbestos containing materials will be liable for all damages and cleanup costs.
3. Where disturbance of asbestos is likely, it has been addressed in the contract for removal. If contact with the presence of asbestos is presented, stop all work in the immediate area and immediately contact the COR and the Industrial Hygienist/Safety Office to make necessary arrangements for removal.
4. In some areas, asbestos insulation has been identified on elbows between fiberglass piping insulation as patching materials among the fiberglass insulation. Fiberglass insulation used in this facility is usually yellow or pink in color, wrapped either by cloth or paper lagging.
5. To protect and ensure all your employees are aware that asbestos containing materials have been used in the construction of this facility, you are required to have them review this section and complete the awareness statement included as Attachment A. Once this documentation has been signed by all employees, forward to the COR for documentation.
6. A complete assessment of asbestos materials and conditions are available for viewing by contacting the COR. Prior to performing work above any ceiling or starting in a new area, consult with the COR concerning existing conditions of ACM.
7. Some of the areas in the facility are identified as restricted areas due to condition of ACM. These are readily labeled. Do not enter these areas unless first contacting the COR. Entry requirements to these areas are awareness of the hazards, proper protective clothing (coveralls and respirators), and personal monitoring in accordance with OSHA requirements.
8. Submit contractor asbestos awareness statements for all persons working on the site prior to commencing work.

J. Environmental Protection: (See Environmental Compliance: PG-18-17 http://www.cfm.va.gov/TIL/)

1. It may help you to be aware of the seriousness, which the environmental

protection requirements of each contract are regarded. Adherence to these requirements is subject to continuing scrutiny from the community and backed by severe penalties, such as fines and incarceration. These environmental requirements will be strictly enforced.

2. No hazardous materials will be disposed of on Government property during and after completion of the project. All waste will be hauled off-site or disposed of in contractor-owned and operated waste removal containers.
3. A copy of all waste manifests for special or hazardous wastes will be forwarded to the COR and the Industrial Hygienist. Environmental requirements will be strictly enforced.

K. Construction Barriers

1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas, other areas that are described in phasing requirements, and all adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
2. No Plastic will be used in separating construction area from Medical Center.

L. "Permit Required" Confined Spaces:

1. Contractors performing work on this facility will follow all requirements outlined in OSHA Standards for working in confined spaces. There are numerous "permit required" confined spaces on this facility. These spaces have been identified as a confined space. Some spaces have been posted, but most of them have not due to their configuration.
2. Confined spaces are areas, which are large enough to be entered, have limited egress/exit potential, and are not designed for permanent human occupancy. If you encounter any space, which meets this definition, if it is a suspected confined space, please contact the COR and the Industrial Hygienist/Safety Office for a determination.
3. Contractors performing work in confined spaces are responsible for compliance with all applicable standards and regulations.

M. Housekeeping:

1. Protect patients and VA personnel in occupied areas from the hazards of dust, noise, construction debris and material associated with a construction environment. Keep work area clear, clean and free of loose debris, construction materials and partially installed work which would create a safety hazard or interfere with VA personnel duties and traffic.
2. Wet mop occupied areas clean and remove any accumulation of dust/debris from cutting or drilling from any surface at the end of each workday. Mops and buckets will <u>not</u> be provided.
3. Make every effort to keep dust and noise to a minimum at all times. Take special precautions to protect VA equipment from damage including excessive dust.
4. Maintain clear access to mechanical, electrical devices, equipment and main corridors. This will ensure access to existing systems in the event of an emergency.
5. Clean area of all construction debris and dust upon completion of demolition and/or renovation at the end of each workday.
6. During construction operations, keep existing finishes protected from damage. Cover and protect all carpets during construction. Any carpets or surfaces damaged as a result of construction activities will be replaced by the contractor and at the contractor's expense.

N. Hot Work Permits:

1. Any hot work operations including cutting, welding, thermal welding, brazing, soldering, grinding, thermal spraying, thawing pipes or any other similar activity,

will require a Hot Work Permit to be obtained by the Contractor from the Safety Officer. The Contractor will be responsible for conforming to all Medical Center regulations, policies and procedures concerning Hot Work Permits as outlined below:

a. Prior to the performance of hot work in patient-occupied buildings, a request for a Hot Work Permit will be made to the Safety Department.
b. The COR and a representative from the Safety Office will inspect the area and ensure that the requirements of NFPA 241 and OSHA standards have been satisfied. The Hot Work Permit will be granted and will be posted in the immediate area of the work.
c. The Hot Work Permit will apply only to the location identified on the permit. If additional areas involve hot work, additional permits must be requested.
d. Upon completion of all hot work, the COR will be notified by the responsible individual to perform a re-inspection of the area.

2. Do not use any of the extinguishers in the medical center for standby purpose while conducting hot work. Contractors are required to supply their own Class ABC extinguishers. Medical center extinguishers are only to be used in the event of a fire.

O. Utility Shutdowns
1. Contractor shall submit a request to interrupt any such services to COR, in writing, two weeks in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption. This requirement supersedes the General Requirements 01 00 00 Section 1.6 K.2

P. Penetration Permits
1. Contractor to complete Penetration Permit prior to commencement of any penetrations in fire rated construction barriers. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration fire stop materials in accordance with Section 07 84 00, FIRESTOPPING.

Q. Emergency Medical Services:
1. Emergency medical services for stabilization purposes are available for contractors at this facility. For medical emergencies, dial 911 when inside any building at the University Drive, Aspinwall, and Highland Drive divisions. Report the nature of the emergency and location. The operator will dispatch in-house personnel or coordinate an outside emergency assistance based on the nature of the emergency.

R. Use of Government Owned Material and Equipment:
1. Use of Government owned material and equipment is PROHIBITED. This includes flatbeds, etc. for delivery of materials.

S. Superintendent Communications:
1. At all times during the performance of this contract, the Contractors Superintendent is to be available by telephone. At the beginning of the contract and prior to beginning any construction, supply the COR with the telephone number for the superintendent. Portable cellular phones are not to be used in any medical center buildings.

T. Parking:
1. There will be no on-site Contractor parking. There will be no contractor staging outside of construction area.

U. Traffic:
1. Traffic hazards are minimal at this facility. Drivers should be particularly concerned with pedestrian traffic.
2. Seat belt use is mandatory on the station.
3. Federal police officers maintain a 24-hour patrol of the area.
4. No parking/driving on sidewalks and/or grass.

5. The City of Pittsburgh has installed “No Truck Traffic” signs on Robinson Street. Contractors shall comply with this ordinance when delivering and removing materials to the work site

V. Smoking:
   1. No smoking is permitted in buildings or around hazardous areas. Any smoking inside a government building is subject to a fine without warning.

W. Road Closures:
   1. For any work requiring closure of a road or parking lot, the contractor will submit a request for closure in writing at least 5 days in advance for approval by the COR and the Fire Department. Contractor requiring road closures will complete a permit and forward to the COR for authorization by the Fire Department. Permits will be issued for no longer than 1 week. Multiple permits will authorize work lasting longer than 1 week.

X. Delivery of Materials:
   1. All materials to be delivered to VA loading docks will be coordinated by the contractor. VA personnel will not receive any contractor material and the contractor will meet all deliveries at the dock to ensure receipt, custody, and removal of items from the dock so not to impact hospital function. If contractor is not present on the site to receive materials in a timely manner, the delivery will be refused and sent away to free the dock space. Extension of construction time will not be granted for refusal to receive contractor materials.

Y. Phasing:
   1. Contractor shall submit a schedule of approximate phasing dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. Contractor shall notify the COR two weeks in advance of the proposed date of starting work in each specific area of site, building or portion thereof. Arrange such phasing dates to insure accomplishment of this work in successive phases. The Medical Center Director, COR and the Contractor, prior to any work being completed, must mutually agree to this phasing schedule. Failure to comply with the dates agreed to on the phasing schedule without approved justification may result in a contract modification that benefits the government.

Z. Recycling:
   1. It is the contractors’ responsibility to recycle as much of the construction by-products as possible. This would include but not be limited to steel, copper, etc. The contractor will keep a manifest of the items recycled and approximate amounts. The contractor will also make every effort to use recycled materials during the construction of the project. This will be monitored through the submittal process, but will require that the contractor manifest all recycled materials used during the course of the project.
      a. Recycled content products shall be used in execution of this contract wherever such products are available.
      b. The contractor shall keep a record of all recycled content products used in execution of this contract. The record shall identify recycled content products used in execution of the work with approximate quantities.
      c. Contractor shall also keep a record of all wastes and by products recycled as a result of the execution of this contract. The record shall identify products recycled along with approximate quantities.
      d. Contractor shall submit copies of record reflecting all recycled products used in the contract with each application for progress payment. The record shall include the types and quantities of products used. Negative reports are required.

DEPARTMENT OF VETERANS AFFAIRS
VA Pittsburgh Healthcare System
Pittsburgh, PA

Memorandum EC-043

November 28, 2005

INFECTION CONTROL AND SAFETY/HEALTH GUIDELINES FOR CONSTRUCTION AND RENOVATION

I. PURPOSE

To prevent the acquisition of hospital-acquired infections in patients and to decrease the risk of exposure of employees, visitors, and contractors, to potential infections, safety and other health hazards during renovation or construction activities at the VA Pittsburgh Healthcare System. In addition, to establish procedures and programs for proper management and remediation of any mold found inside the VAPHS.

II. POLICY

All renovation or construction projects will be reviewed with Infection Control and the Safety Office during the planning phases.

A. Infection Control and the Safety Office will participate in meetings and area walk-through inspections as necessary. All walk-throughs of the construction area must be coordinated with the Facility Management Project Section.

B. All construction workers, including subcontractors, and Facilities Management employees, must follow the infection control procedures as described in this guideline.

III. RESPONSIBILITIES

A. Medical Center Director will assure that all project coordinators, engineers and Vice President Facilities Management (VP FMS) apprises the Infection Control nurse and the Safety Office of plans for all projects involving construction and/or renovation of clinical and non-clinical areas in the medical center.

B. Supervisors are responsible to inform Infection Control and/or the Safety Office of employee concerns for potential mold growth.

C. Infection Control Nurse, the Safety Office, and/or Project Engineering is responsible for:

1. Upon request, conduct Environmental assessments for the existence of mold, or moldy building materials.

2. Specify appropriate removal procedures and provide infection prevention and control recommendations for mold/moldy building materials during construction and renovation projects. Guidelines established by CDC, EPA, and OSHA will be used.

3. Notify Facilities Management and Employee Health of areas of mold concerns.

4. Notify employees in the area of the status of mold concerns

5. If applicable, report to the Safety Committee, the status of mold issues and the impact of employees.

6. Complete Appendix B, Mold Remediation Risk Assessment to determine proper remediation techniques and precautions to be applied.

7. The Project Engineer will issue the Infection Control Construction Permit.

8. Monitor and response to safety and hazard related issues during construction and renovation projects.

D. Facilities Management (Environmental Management and Maintenance and Repair) employees are responsible to:

1. Report all suspect mold to Safety and/or Infection Control.

2. Follow approval mold removal procedures as recommended by Safety and/or Infection Control.

3. Use the attached Infection Control Construction Permit (Attachment C) for any Mold Remediation Activity that qualify as Type C or Type D, and for Type B activities in the highest risk areas, as designated on the Risk Assessment, Appendix B.

IV. PROCEDURES:

A. Planning Phase

1. Infection Control and the Safety Office will participate in the project pre-construction meeting.

2. Infection Control and Safety Officer will be involved in the planning phases for all renovation and new construction projects and have input specific to the following major components (design):

a. Number and placement of isolation rooms

b. Air handling systems; use of adjunctive measures such as ultraviolet germicidal irradiation (UVGI) and appropriate filtration systems

c. Number and placement of handwashing facilities

d. Staff and patient traffic patterns for the duration of the project.

e. Relocation decisions regarding patient care areas, storage areas, etc.

f. Water supply and plumbing

g. Number and placement of eye-wash, shower, hazardous chemical or compressed gas facilities.

h. Construction waste containment, transport and disposal

i. Selection and installation of medical equipment as it relates to infection control.

j. Selection of finishes and surfaces that can be effectively cleaned.

3. Renovation projects in-house may also be done by our employees. Mold Removal Guidelines (Attachment E) will be used for these projects. Portions may also be used for larger projects requiring outside contractors.

4. The Project Engineer, with the assistance of the Infection Control Nurse will complete the Risk Assessment (Attachment A) and Construction Permit (Attachment C). The Permit is then signed by the Project Engineer, Infection Control Nurse, the contractor, and/or the VA MIT/M&R.

B. Operational Phase

1. Medical Waste

a. Environmental Management Service staff shall remove any medical waste, including sharps containers, from areas to be renovated or constructed BEFORE the start of the project.

b. Infection Control shall be notified immediately if unexpected medical waste is encountered.

c. Environmental Management Services will do appropriate cleaning of all areas prior to the start of the project and at the completion of the project.

2. Barrier Walls: Construction or renovation sites must be separated from patient-care areas and critical areas such as SPD and Pharmacy by barriers that keep the dirt and dust inside the worksite.

a. The integrity of the barrier walls must assure a complete seal of the construction area from adjacent areas.

b. Rigid construction or fire-rated plastic sheeting (4 or 6 mil thickness) are used, depending on the location of the project, adjacent uses, and duration of the project.

c. Walls will be dustproof with seals maintained at the full perimeter of the walls, which allow for minimization of dust collection and spread.

3. Environmental Control

a. Negative air pressure and HEPA (High Efficiency Particulate Air) filter vacuum system rated at 95% capture of 0.3 microns will be implemented as needed within the construction zone, at the discretion of the Engineering Department and the Construction site manager.

b. There should be no recirculation of air, and ventilation filters will be changed as needed.

c. Demolition debris will be disposed of into non-infectious waste trash bins and removed from the construction area daily, using specified traffic patterns. All waste bins will be tightly covered during transport outside of the construction site.

d. "Sticky" or walk-off mats shall be utilized immediately outside the construction zone and elevators to remove dust and soil from shoes, cart wheels, etc. as personnel exit the area. The "sticky" mat must be large enough to cover the entire exit and is changed whenever necessary, but at a minimum daily.

e. Exterior windowsills must be assured to minimize infiltration of outside excavation debris; Windows will remain closed as much as feasible during the construction/renovation process.

f. Control, collection and disposal must be provided for any drain liquid or sludge encountered when Facility employees or contractors are demolishing plumbing.

4. Traffic Control

a. Designated entry and exit procedures will be defined (in conjunction with any necessary Interim Life Safety Measures) for each construction project where applicable. To the extent feasible, the entry and exit procedures will be annotated on the contract drawings and explained during pre-bid and pre-construction meetings.

b. All egress pathways will be free of debris.

c. Unauthorized personnel will not be allowed to enter the construction zone.

d. Only designated elevators will be used for construction activities during scheduled times.

e. Construction areas will be fitted with self closing lockable doors and will remain locked at all times.

5. Cleaning

a. The construction zone and adjacent entry areas shall be maintained in a clean and sanitary manner by the contractors and will be swept and wet mopped at the end of each day or more frequently as required.

b. Environmental Management Services will be responsible for the routine cleaning of adjacent areas including stairwells and for the terminal cleaning of the construction zone prior to the opening of the newly renovated or constructed area. Specific responsibility will be defined in the construction contracts.

6. Personnel Requirements

a. Clothing shall be free of loose soil and debris upon exiting the construction zone.

b. Personnel entering sterile/invasive procedure areas will be provided with a disposable jump suit, head covering and shoe coverings, which must be removed prior to exiting the work area.

1. Tools and equipment must be damp-wiped prior to entry and exit from sterile and invasive procedure areas.

2. Tools and equipment soiled with blood and body fluids will be cleaned with an approved germicide (e.g. Cavicide).

c. Facilities Management employees shall receive Infection Control and Safety and Health training as it relates to construction.

7. Environmental Monitoring - Infection Control, in conjunction with Facilities Management and Safety, will plan for environmental monitoring as appropriate for the project.

C. Completion Phase

1. The area will be thoroughly cleaned and disinfected by EMS before being placed into service.

2. The VA Plumbing shop will flush water supply lines before placing newly renovated or constructed areas into service. Infection Control, Safety Office and affected areas will be notified prior to the scheduled date for the flushing procedure.

3. Infection Control personnel shall certify that water supply lines are safe for use.

D. Compliance Monitoring

1. The Project Engineer or COTR (Contracting Officer's Technical Representative) will conduct weekly safety inspections.

2. Medical center staff (Project Engineer, Safety Manager, Industrial Hygiene, Infection Control) and the contractor will conduct compliance monitoring as necessary. The following parameters will be monitored:

a. Air quality
b. Integrity of barrier walls and floors
c. Infection Control
d. Noise
e. Traffic Control

V. REFERENCES

Bartley, J. Construction and Renovation: APIC Text of Infection Control and Epidemiology, APIC, Inc. 2005

Guidelines for Environmental Infection Control in Healthcare Facilities - Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC), MMWR Vol. 43 (RR-13): 1-132

CAMH, CAMAC, CAMLTC, CAMBHC EC 3.2.1 2002 edition

OSHA Occupational Safety and Health standards 29 CFR 1910 and 1960
www.osha.gov/SLTC/indoorairquality/index.html

JCAHO Environment of Care Standards

Centers for Disease Control (CDC) information on "Molds in the Environment"
www.cdc.gov/nceh/airpollution/mold/moldfacts.htm

State of the Science on Molds and Human Health – Stephen C. Redd, MD, Chief, Air Pollution and Respiratory Health Branch, National Center of Environmental Health, Centers for Disease Control & Prevention – US House of Representatives
www.cdc.gov/nceh/airpollution/images/moldsci.pdf

Mold Remediation in Schools and Commercial Buildings, EPA March 2001

VI. RESCISSION

Memorandum EC-43, dated September 19, 2002

VII. CONCURRENCES

001, 11, 11D, 00B, 05, 00S, all Service Line VPs, AFGE Local 2028 and AFGE Local 3344

VIII. EXPIRATION

This memorandum will automatically expire on November 28, 2008.

//*Signed*//
MICHAEL E. MORELAND
Director

Attachments:

A: Risk Assessment Worksheet
B: Infection Control Risk Assessment Matrix
C: Infection Control Construction Permit
D: Infection Control Orientation - Construction Workers
E. Mold Removal Guidelines

RISK ASSESSMENT
PLANNING STAGE HAZARD ANALYSIS WORKSHEET

Rate Potential for Compromise on Scale of 5-1

5 being the highest possibility of occurrence or the weakest resources

1 being the least likely to occur or the strongest resources

List Type of Construction Activity:
(New Construction/Renovation/Demolition)

_____

Potential Compromise to:	Potential for Compromise	List Patient Care Areas Impacted	List Non-Patient Care Areas Impacted	List Public Access Areas Impacted	List Control Activities Needed
Air Requirements		_____ _____ _____	_____ _____ _____	_____ _____ _____	1. ____ 2. ____ 3. ____
Infection Control		_____ _____ _____	_____ _____ _____	_____ _____ _____	1. ____ 2. ____ 3. ____
Utility Failure - (Check Effected Utility) ❑ Communications/Telephone ❑ Electrical ❑ Generator ❑ Temperature ❑ HVAC ❑ Medical/Natural Gas ❑ Medical Vacuum ❑ Sewer ❑ Water ❑ Other: _____		_____ _____ _____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____ _____ _____	1. ____ 2. ____ 3. ____ 4. ____ 5. ____ 6. ____ 7. ____ 8. ____ 9. ____
Usual Noise Levels		_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	1. ____ 2. ____ 3. ____ 4. ____
Vibration Levels		_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	1. ____ 2. ____ 3. ____ 4. ____
Emergency Procedures (Check Effected Procedure) ❑ Fire Safety ❑ Emergency (Disaster) Management ❑ Security ❑ Other: _____		_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	1. ____ 2. ____ 3. ____ 4. ____ 5. ____ 6. ____

Infection Control Risk Assessment
Matrix of Precautions for Construction & Renovation

Step 1: Using the following table, *identify* the type of Construction Project Activity (A-D)

Type A	**Inspection and Non-Invasive Activities** Includes, but is not limited to: • Removal of ceiling tiles for visual inspection limited to 1 tile per 50 square feet. • Painting (but not sanding) • Wallcovering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings or other than for visual inspection.
Type B	**Small scale, short duration activities which create minimal dust** Includes, but is not limited to: • Installation of telephone and computer cabling • Access to chase spaces • Cutting of walls or ceiling where dust migration can be controlled
Type C	**Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies** Includes, but is not limited to: • Sanding of walls for painting or wall covering • Removal of floor coverings, ceiling tiles and casework • New wall construction • Minor duct work or electrical work above ceilings • Major cabling activities • Any activity which cannot be completed within a single workshift
Type D	**Major demolition and construction projects** Includes, but is not limited to: • Activities which require consecutive work shifts • Requires heavy demolition or removal of a complete cabling system • New construction

Note: Reference: "www.icanprevent.com"

Step 2: Using the following table, *identify the* Patient Risk Groups that will be affected. If more than one risk group will be affected, select the higher risk group:

Low Risk	Medium Risk	High Risk	Highest Risk
• Office areas	• Cardiology • Echocardiography • Endoscopy • Nuclear Medicine • Physical Therapy • Radiology/MRI • Respirator Therapy	• CCU • Emergency Room • Labor & Delivery • Laboratories (specimen) • Newborn Nursery • Outpatient Surgery • Pediatrics • Pharmacy • Post-Anesthesia Care Unit • Surgical Units	• Any area caring for immunocompromised patients • Burn Unit • Cardiac Cath Lab • Central Sterile Supply • Intensive Care Units • Medical Unit • Negative pressure isolation rooms • Oncology • Operating rooms including C-section rooms

Step 3:
Match the Patient Risk Group (low, medium, high, highest) with the planned **Construction Project Type** (A, B, C, D) on the IC Matrix to find the **Class of Precautions** (I, II, III, IV) or level of infection control activities required. Classes of precautions are described in the table on the next page.

IC Matrix: Class of Precautions for Construction Projects by Patient Risk

Patient Risk Group	Type A	Type B	Type C	Type D
LOW Risk Group	I	II	II	III/IV
MEDIUM Risk Group	I	II	III	IV
HIGH Risk Group	I	II	III/IV	IV
HIGHEST Risk Group	II	III/IV	III/IV	IV

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

Infection Control Construction Permit

Location of Construction:	Permit No:
Project Coordinator:	Project Start Date:
Contractor Performing Work:	Estimated Duration:
Supervisor:	Permit Expiration Date:
	Telephone:

YES	NO	CONSTRUCTION ACTIVITY	YES	NO	INFECTION CONTROL RISK GROUP
		TYPE A: Inspection, non-invasive activity.			GROUP 1: Low Risk
		TYPE B: Small scale, short duration, moderate to high levels.			GROUP 2: Medium Risk
		TYPE C: Activity generates moderate to high levels of dust, requires greater 1 work Shift for completion.			GROUP 3: Medium/High Risk
		TYPE D: Major duration and construction activities requiring consecutive work shifts.			GROUP 4: Highest Risk

Class 1	1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace any ceiling tile displaced for visual inspection.	3. Minor demolition for remodeling.
Class II	1. Provides active means to prevent air-borne dust from dispensing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Wipe surfaces with disinfectant.	6. Contain construction waste before transport in tightly covered containers. 7. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 8. Place dust mat at entrance and exit of work area. 9. Remove or isolate HVAC system in areas where work is being performed.
Class III Date: Initials: Initials:	1. Obtain infection control permit before construction begins. 2. Isolate HVAC system in area where work is being done to prevent contamination of the duct system. 3. Complete all critical barriers or implement control cube method before construction begins. 4. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 5. Do not remove barriers from work area until complete project is thoroughly cleaned by Environmental Services Department.	6. Vacuum work with HEPA filtered vacuums. 7. Wet mop with disinfectant. 8 Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 9. Contain construction waste before transport in tightly covered containers. 10. Cover transport receptacles or carts. Tape covering. 11. Remove or isolate HVAC system in areas where work is being performed.
Class IV Date: Initials: Initials:	1. Obtain infection control permit before construction begins. 2. Isolate HVAC system in areas where work is being done to prevent contamination of duct systems. 3. Complete all critical barriers or implement control cube method before construction beings. 4. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 5. Seal holes, pipes, conduits, and punctures appropriately. 6. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site ore they can wear cloth or paper coveralls that are removed each time they leave the work site.	7. All personnel entering work site are required to wear shoe covers. 8. Do not remove barriers from work area until completed project is thoroughly cleaned by the Environmental Services Department. 9. Vacuum work area with HEPA filtered vacuums. 10. Wet mop with disinfectant. 11. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 12. Contain construction waste before transport in tightly covered containers. 13. Cover transport receptacles or carts. Tape covering 14. Remove or isolate HVAC system in areas where work is being done.

COTR	Date	Infection Control Nurse	Date
Project Manager	Date	Contractor	Date

Description of Required Infection Control Precautions by Class

	During Construction Project	Upon Completion of Project
Class I	1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection.	
Class II	1. Provide active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Place dust mat at entrance and exit of work area. 6. Remove or isolate HVAC system in areas where work is being performed.	1. Wipe work surfaces with disinfectant. 2. Contain construction waste before transport in tightly covered containers. 3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 4. Remove isolation of HVAC system in areas where work is being performed.
Class III	1. Remove or isolate HVAC system in areas where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum or vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Contain construction waste before transport in tightly covered containers. 5. Cover transport receptacles or carts. Tape covering unless solid lid.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department and thoroughly cleaned by the owner's Environmental Services Department. 2. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 3. Vacuum work area with HEPA filtered vacuums. 4. Wet mop area with disinfectant. 5. Remove isolation of HVAC system in areas where work is being performed.
Class IV	1. Remove or isolate HVAC system in areas where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum or vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Seal holes, pipes, conduits, and punctures appropriately. 5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site. 6. All personnel entering work site area required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area. 7. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department and thoroughly cleaned by the owner's Environmental Services Department.	1. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction. 2. Contain construction waste before transport in tightly covered containers. 3. Cover transport receptacles or carts. Tape covering unless solid lid. 4. Vacuum work area with HEPA filtered vacuums. 5. Wet mop area with disinfectant. 6. Remove isolation of HVAC system in areas where work is being performed.

Adapted with permission of Virginia Kennedy and Bonnie Barnard, St. Luke's Episcopal Hospital, Huston, TX, www.icanprevent.com.

Infection Control Orientation – Construction Service Workers

The goal of the Infection Control program is to identify and reduce the risks of acquiring and transmitting infections among patients, employees, physicians, and other licensed independent practitioners, contract service workers, volunteers, students, and visitors.

During construction, renovation and minor improvement projects, hidden infectious disease hazards may be released into the air, carried on dust particles or on clothing – for example, fungal organisms such as, *Aspergillus*. *Aspergillus* species may be found in decaying leaves and compost, plaster and drywall, and settled dust. These organisms usually do not cause problems in healthy people, but a hospital is full of sick patients! *Aspergillus* and other fungal organisms can cause illness and even death in premature babies, transplant patients, cancer treatment patients, and patients with lung problems or poor immunity. Therefore, it is critical that you do your part to keep our patients, employees, and visitors as safe and healthy as possible. We, in turn, will make conditions as safe as possible for you.

1. Medical Waste:
    a. We will remove any medical waste, including sharps containers (for used needles and syringes), from construction areas prior to the start of the projects.
    b. If you (contract workers) find any needles, syringes, sharp medical objects, please notify Infection Control (x2916/3393) **IMMEDIATELY**.

2. Barrier Walls:
    a. The construction areas MUST be kept separated from patient care areas by barriers that keep the dust and dirt inside the worksite.
    b. The walls must provide a complete seal of the construction area from adjacent areas (walls may be rigid or 4 or 6 mil thickness plastic).

3. Environmental Control:
    a. Negative air pressure must be maintained within the construction area.
    b. Demolition debris is removed in tightly fitted covered carts – use specified traffic patterns.
    c. Sticky or walk-off mats are placed immediately outside the construction zone and changed whenever necessary to control the spread of dust and dirt.
    d. Exterior window seals are to be used to reduce the amount of outside excavation debris coming into the building.
    e. If demolition chutes are used, they must be sealed when not in use; the chute and damper should be sprayed with water, as necessary to maintain dust control.
    f. Control, collection and disposal must be provided for any drain liquid or sludge found when demolishing plumbing.

4. Traffic Control:
    a. Use designated entry and exit procedures.
    b. Keep all egress pathways free of debris.
    c. No unauthorized personnel should be allowed to enter construction areas.
    d. Use designated elevators only.

5. Cleaning:
    a. Keep the construction area clean on a daily basis.
    b. Dust and dirt **must** be kept to a minimum.

6. Workers:
    a. Clothing must be free of loose soil and debris when exiting the construction area.
    b. Use personal protective equipment (masks, face shields, etc.) as indicated for the task at hand.
    c. Handwashing is the best method of reducing the transmission of infection: always wash your hands with soap and water after visiting the restroom, before eating, when leaving the construction site.

MOLD REMOVAL GUIDELINES

A. MOLD REMOVAL PROCEDURES

1. If mold is suspected in a building, Safety and/or Infection Control will survey for visible mold growth. If visible mold growth is found, Facilities Management Engineering will survey the area to find the source of the moisture, such as a leak of condensation that is causing the mold growth. When visible mold growth is found, it will be removed in accordance with these procedures. Some leaks, especially roof leaks, may take longer to fix than others and extra precautions will be taken in the interim to minimize mold growth.

2. In some cases, mold may grow behind walls, or in other contained, non-visible spaces. If hidden mold growth is suspected in an area after flood or other occurrence of water in the area, a moisture meter will be used to try to locate the hidden mold. If hidden mold is found, it will be removed in accordance with these procedures. If necessary, a section of the wall will be cut out to allow drying.

3. Removal of visible mold will be done according to procedures based on the EPA guidance document *"Mold Remediation in Schools and Commercial Buildings"* printed in March of 2001 and follow the Joint Commission Environment of Care Standards. An Infection Control Risk Assessment will be completed when mold remediation activities qualify as Type C or Type D, and for Type B activities in the highest risk areas, as designated on the Risk Assessment, Appendix B. Staff performing environmental interventions must have training developed by Infection Control and Safety. If there are water damaged materials adjacent to moldy materials, Safety will be consulted to determine if water damaged materials should be removed as well. Some water-damaged materials may harbor mold growth that is not yet visible.

4 In most cases, such as replacement of a few ceiling tiles or removal of mold on limited hard surfaces, containment and use of PPE will not be required for mold removal.

5. In rare cases where there is excessive visible mold in a room or space, it must be cleaned or removed in a contained area. Examples of occasions where containment would be required include work that is expected to generate a moderate to high level of dust, such as removal of building components or demolition of mold contaminated materials.

    a. When these conditions occur, the moldy area will be sealed off from the remainder of the room or buildings with one or two layers of heavy plastic sheeting. Any ventilation ducts in the space will be sealed off with plastic. The area will be kept under slight

negative pressure either with a fan that exhaust directly to the outside or a fan that HEPA filters air and exhausts it back into the building interior. When containment is required, no mold remediation work will be done until containment is set up.

b. Employees performing mold remediation in containment areas must wear personal protective equipment (PPE). The following is required as a minimum: N-95 or half-face respirator with HEPA filter (with current fit test), disposable coveralls, and goggles to protect the eyes from dust. A Powered Air Purifier Respirator (PARR) with HEPA filter can be substituted for the minimum respirator required, and a full-face PAPR or respirator will eliminate the need for dust goggles. If construction equipment will be used that requires additional eye protection, that eye protection must be used as well. Disposable PPE, including the coveralls, must be removed upon leaving the containment area, to prevent potentially moldy dust from being carried through the building. Non-disposable PPE should be rinsed or wiped off before it is removed from the containment area.

c. After all moldy materials are cleaned or removed, dust should be cleaned from all surfaces in the containment area before the containment is removed. Reconstruction of building walls and other fixtures may be completed after the containment is removed. If reconstruction work will create dust, it is strongly recommended that the reconstruction work be done before the containment is cleaned and removed to minimize dust transmission associated with the reconstruction work.

6. If mold growth is found on any non-porous building surfaces or furnishings, such as metal surfaces, concrete, or vinyl floor tile, these surfaces can be thoroughly cleaned and treated with a standard hospital disinfectant solution that is antifungal. Bleach will not be used because of variations in concentration, the absence of a surfactant, and the potential for corrosion/staining. Consult the Industrial Hygienist for proper PPE to be worn while doing the work.

8. If mold growth is found on any porous building materials or furnishings, such as ceiling tiles, wallboard, carpet, fabrics, books, or papers, the moldy portion of those materials or furnishings must be removed and disposed of. Small items or small pieces will be double-bagged using 6-mil polyethylene sheeting and then discarded as ordinary construction waste. Large items should be covered with polyethylene sheeting and sealed with duct tape before they are removed from the area. Precautions must be taken to contain or remove all dust before waste is removed from the containment area into the remainder of the building. Consult the Industrial Hygienist for proper PPE to be worn while doing the work.

8. Ceiling tiles that are known to be or suspected of being moldy should be removed in the following manner unless they are removed inside a containment area: Lift an adjacent ceiling tile that is not suspected of being moldy. Use that opening to observe the tops of ceiling tiles to determine the presence of mold visible from the top. Identify all moldy tiles in the area. For each moldy tile, spray both top and bottom surfaces with a soap or detergent solution. Use enough solution to cover the entire tile surface, but not enough to drip. Once both the top and bottom are dampened, carefully lift the tile, minimizing any impacts that could jar loose any debris. Immediately place the entire tile into a plastic bag for disposal. Seal the bag containing the removed tiles before leaving the arilea. If the leak that wetted the tiles has been eliminated, replace the tiles with fresh ones. If not, replace the tile with a drip basin that will collect any further drips and that can be emptied, keeping all building materials dry.

B. TRAINING

The Industrial Hygienist will be responsible for training all FMS employees involved with mold remediation activities. The training will be conducted annually and will consist of:

1. Awareness of mold in the workplace
2. The use of PPE when necessary
3. Removal of mold under EPA Guidelines, Mold Remediation in Schools and Commercial Buildings
4. Proper disposal of moldy materials and disposable PPE

Department of Veterans Affairs
VA Pittsburgh Healthcare System
Pittsburgh, PA 15240

MEMORANDUM EC-051

February 21, 2013

SAFETY AND HEALTH DURING CONSTRUCTION ACTIVITIES

I. PURPOSE

To establish policy and procedures to ensure that construction projects will be planned, coordinated and regularly inspected to ensure compliance with applicable fire, infection control, environmental, security, safety and occupational health regulations and policies.

II. POLICY

In order to protect patients, staff, visitors and contractors from safety and health hazards associated with construction activities, this policy is established for the VA Pittsburgh Healthcare System (VAPHS) and for all property where construction is undertaken.

III. PROCEDURES

A. This policy requires that strategies be established to control the hazards inherent in conducting construction or maintenance operations in areas that are occupied by patients, visitors or healthcare staff. These strategies include the assignment of appropriate responsibility at all levels of the organization, establishing and maintaining the necessary expertise to manage an effective construction health and safety program, applying technical guidance and best practices to assist in managing the program and providing a construction safety multi-disciplinary team to oversee and enforce the application of this policy.

B. Construction activities shall be defined to include delegated minor or non-recurring maintenance projects performed by contractors or purchase and hire personnel, as well as station-level projects performed by contractors, purchase and hire personnel or station Maintenance and Operations (M&O) personnel. Construction shall also include non-delegated projects including majors, and VAPHS shall coordinate those construction impacts with the project's Resident Engineer through the VP, Facilities Management Service or designee single point of contact. This definition also applies to enhanced-use and lease projects

related to structures for which VAPHS maintains management responsibility or authority.

C. The intention of this construction safety program is to reduce the potential for injury and illness to VA patients, employees and visitors that might result from unsafe construction activities; to increase the level of construction safety expertise of VA employees; to decrease the potential for serious Occupational Safety and Health Administration (OSHA) violations; to provide a guideline for addressing safety-related construction issues; and to reduce the potential for property and liability exposures due to construction-related activities.

D. Proper application of this program will reduce the potential for liability, which could result from construction accidents, life safety deficiencies or infection control failures.

E. Design Review

1. The Contracting Officer Representative (COR) will make available to the safety/infection control staff, the technical plans and specifications for construction projects in accordance with the design review schedule, as written in the contract. The design review schedule will be established to afford the safety/infection control staff sufficient time to perform the review.

2. The safety/infection control staff will assist the project manager to identify special safety or health training requirements that must be met by the contractor or vendor, such as pre-construction training and/or periodic training. They shall monitor the need for specialized training and shall coordinate such training with the COR or project manager.

3. The VISN Safety & Fire Protection Engineer and infection control staff, in conjunction with the project manager, will evaluate the need for ILSMs or ICRA requirements using The Joint Commission current criteria or CDC guidelines, and implement accordingly.

4. The Interim Life Safety Measures (ILSM) guidelines, procedures, and matrix can be found in Attachment C.

5. The Infection Control Risk Assessment (IRCA) guidelines, procedures, and matrix can be found in Attachment D.

6. A current copy of EC-051 shall be included in the Construction Documents scope of work for all construction projects.

F. Construction Contract Submittals. The COR and safety staff will review the submittal list to identify those items that are key to VA staff safety, patient or

visitor safety and any regulatory compliance and the safety/infection control staff will ensure, within an agreeable timeframe, those targeted submittals are reviewed for completeness and accuracy.

G. Pre-Construction Meetings. A meeting of the COR, safety/infection control staff and contractor or subcontractors must be held prior to initiation of work to review the contractor plans to address the ILSM and ICRA measures, and to ensure everyone is familiar with their role for the following:

1. Identification of the contractor and the subcontractor CP(s).

2. Identification of local, state and federal safety and environmental regulations that are in effect and applicable during the construction; e.g., OSHA, EPA, National Fire Protection Association (NFPA) and VA regulations, hot work permits, fire detection and suppression system disruptions, etc.

3. Review of all ILSM or ICRA requirements that apply to the phase or phases of the contract, and/or establish periodic review.

4. The Pre-Construction Risk Assessment/Safety Construction (PCRA) shall be completed during the Pre-Construction meeting to ensure the Environment of Care level is maintained as listed in the General Requirements specification. The PCRA Permit can be found in Attachment E.

5. Items for discussion during the Pre-Construction Meetings are identified on Attachment A, Pre-Construction Meeting Checklist.

6. The Contract Workers Safety Information guidelines, checklists, and permits are provided in Attachment B.

H. Construction Site Oversight and Inspections. The VA will provide site oversight and inspections to ensure the welfare of the patients, visitors, staff and /or environment.

1. Construction activities must not take place without appropriate VA oversight. This VA responsibility must be conducted by staff on duty and located on the property in which the construction activities are taking place. Should the project manager not be available to provide this oversight, a replacement will be designated. The replacement shall have sufficient time and ability to perform such duties, and shall have the same level of authority as the project manager of the project.

2. The project manager shall visit the site daily, conduct a safety/health inspection of the construction site, and document the findings as needed. The project manager shall make all documents

available for review by the CO, safety staff, or other regulatory agency representative.

3. The safety/infection control staff must inspect the site daily to ensure continuous compliance, and shall document the findings. All documents shall be available to regulatory agency representatives upon request.

I. Construction Site Activity Intervention.

1. All work must be immediately stopped should the COR, project manager, infection control or safety staff identify activities that could reasonably be expected to cause death or serious physical harm immediately or before the imminence of such danger can be eliminated.

2. Unresolved safety issues, including continuous and/or repetitive deficiencies that are the cumulative effect, may represent a more serious safety concern and will be brought to the attention of the COR for resolution.

a. At a minimum, the Contracting Officer (CO) must notify the contractor in writing of noncompliance with life safety, OSHA, environmental and infection control standards requiring timely corrective action.

b. Repeated contractor failure to correct hazards or blatant disregard for safety and environment will not be tolerated. Lack of cooperative action by the contractor will result in increasing pressure to comply, including contact of government enforcement agencies of job safety and the environment.

J. Infection Control. Contractors must strictly adhere to infection control measures to control the generation of dust, and provide for the containment of the dust in and around patient care areas, supplies and equipment during all phases of the construction.

1. Where possible, the construction area of risk levels 3 and 4 shall be under negative pressure, ensuring there is an appreciable flow of clean air from the VA occupied area into the demolition/construction area.

2. Construction debris transported through the VA occupied portion of the buildings shall be covered, and carts will be wiped down or vacuumed to reduce the transporting of dust and contamination from construction areas to occupied areas. Higher risk areas to be avoided if possible.

3. Construction employees shall remove or cover dust-laden clothing before entering the VA occupied portion of the facility when practical.

4. Carpet/sticky mats shall be placed at all construction site entrances and satisfactorily maintained so as to minimize the tracking of dust into the VA occupied portion of the buildings.

5. Dry sweeping of dust and debris may only be performed in a manner that does not create a dust issue in the VA occupied portion of the buildings.

K. Post-Construction Survey.

1. The COR, project manager, safety/infection control staff, Environment Management Systems (EMS) staff or others shall conduct a post construction survey of the site to ensure compliance and functionality of all building components and systems. Punch lists shall be developed and tracked for completion by the project manager.

2. Facility safety/infection control staff and the VISN Safety & Fire Protection Engineer shall be offered a pre-occupancy inspection for those projects.

IV. RESPONSIBILITY

A. Director

1. Establish and monitor an effective facility construction safety program.

2. Establish a multidisciplinary team (Construction Safety Committee) with representatives from the following program areas:

a. Infection Control
b. Patient Safety
c. Occupational Safety and Health
d. Police
e. Engineering
f. Local Union Safety Representatives (from affected bargaining units)
g. Contracting
h. Green Environmental Management Systems (GEMS)

3. Insure appropriate staff receives training in construction safety.

4. Insure Competent Persons (CPs) are designated who have the necessary training, experience and authority to carry out their responsibilities with respect to safety and health during construction activities.

NOTE: OSHA Title 29 Code of Federal regulations (CFR) 1926.32(f) states "competent person means one who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them."

Qualified VA staff must be appointed to serve as CP for construction work performed by VA employees. The name and qualifications of the CP must be identified in writing and noted in the minutes of the facility safety committee (or equivalent body) responsible for the safety management functions as defined under The Joint Commission Environment of Care Standard.

5. Insure the Construction Safety Committee functions to:

a. Protect patients, visitors, and employees from traumatic injury, as well as occupational and facility-associated infections.

b. Oversee compliance with OSHA and state construction safety regulations.

c. Oversee compliance with Environmental Protection Agency (EPA) and state environmental regulations.

d. Respond to, investigate and report violations of these policies to upper management.

6. Develop and implement a written facility policy addressing the responsibilities of the Construction Safety Committee.

7. Insure that VA staff receives training as follows:

a. Appointed CPs, Contracting Officer's Technical Representatives CORs and facility Safety Program Managers complete OSHA's 30-hour construction safety course.

b. Engineering supervisors and foremen who oversee construction work complete OSHA's 10-hour or 30-hour construction safety course.

8. Ensures multidisciplinary participation as necessary with respect to the nature of hazards associated with the construction project(s). Participation may change as the project progresses.

9. Ensures appropriate staff receives training in construction safety including specified construction safety 10-hour and 30-hour courses.

B. Associate Director: Receives delegated responsibility from the Director, as appropriate, for oversight of these policies.

C. VP, Facilities Management Service:

1. Receives delegated responsibility from the Associate Director, as appropriate, for oversight of these policies.

2. Insures policies are addressed by all sections of engineering having oversight of construction.

D. Projects Section Manager:

1. Works through safety and health staff, CORs maintenance staff, contractors and the Construction Safety Committee to plan, coordinate and monitor the construction safety program for all projects at the facility.

2. Participates in OSHA's 30-hour construction safety training and refresher courses. Ensures all project staff is in compliance.

3. Participates in periodic inspections of construction sites to ensure compliance with safety elements of the construction contract and performance of the program.

4. Chairs the Construction Safety Committee and ensures contract requirements meet the committee's approval.

5. Supports the CPs, VISN Safety & Fire Protection Engineer, Infection Control Practitioner, Contracting Officer and engineering staff in implementation of the construction safety program.

6. Works with contracting staff to insure competent staff are assigned as CORs to oversee work.

E. Engineering Program Manager:

1. Participates in OSHA's 10-hour construction safety training and refresher courses. Ensures all employees are in compliance.

2. Participates in periodic inspections of in-house construction sites to ensure compliance with safety elements of the construction contract and performance of the program.

3. Insures in-house work forces have necessary training and competency for tasks being performed.

F. Chief of Biomedical Engineering: Ensures all construction accomplished in support of major equipment installations (as a part of the equipment purchase) are in compliance with this policy and these procedures.

G. Acquisition & Materiel Management Officer:

1. Participates in OSHA's 10-hour construction safety training and refresher courses shall be encouraged. Ensures all Contracting Officers are in compliance with the training.

2. Ensures safety elements of this policy are included in each construction contract.

3. Evaluates past safety records of prospective contractors and considers this information in the contract award process.

4. Serves as the single designee on the Construction Safety Committee ensuring contracts meet the committee's requirements.

5. Supports the CP, VISN Safety & Fire Protection Engineer, Resident Engineer, COR, and appropriate staff in implementing the construction safety program.

6. Ensures that construction contracts awarded after July 31, 2005, specify that on-site general and sub-contractor's construction workers have completed the OSHA 10-hour construction worker course, the 30-hour construction course, or other relevant competency training, as determined by the VA CP with input from the Construction Safety Committee. The determination for training is based on the project hazards and complexity, State and Federal regulations and VA requirements.

7. Notifies the contractor in writing of any noncompliance with life safety, OSHA, environmental and infection control standards, and requiring timely action.

8. Initiates any appropriate penalties or actions as specified in the contract should the contractor fail to take appropriate action.

9. Provides technical support to the safety staff, infection control staff and other related parties on the interpretation of contract language relative to safety requirements.

10. Ensures that the contractor meets and documents any required safety and health inspection activities.

H. Contracting Officer's Representative (COR) VA Competent Person):

1. Participates in OSHA's 30-hour construction safety training program and refresher courses.

2. Is trained and designated as a CP for the purposes of this policy.

3. The team member most familiar with the technical aspects of his/her designated project, inspects his/her project on a daily basis to identify and documents deficiencies in the work including safety and infection control. Acts to correct deficiencies on-the-spot whenever possible.

4. Reports all deficiencies to the multi-disciplinary team whether corrected or not. Providing timely verbal or written notification to the CO, Safety Manager, infection control staff or other disciplines of any identified safety issues.

5. Reviews project with Infection Control Program Manager.

6. Consults with other members of the team, as appropriate, to assure that all deficiencies are handled properly.

7. Consults with member of the team, during design or planning to establish the risks to be addressed and the degree of protection appropriate to the situation.

8. Monitors compliance with relevant safety and health requirements by the contractor in the field. Performing and documenting daily work site safety and health inspections as they pertain to the welfare of patients, visitors and staff.

9. Keeps the Safety Manager informed of where and when construction will be taking place, as well as the general nature of the work to be performed.

10. Reviews the project design and becomes familiar with the processes a contractor will use to complete the project.

11. Provides technical assistance to the CO, safety or infection control staff relative to construction and contract requirements. Reviewing submitted contractor documentation.

12. Coordinates the temporary shutdown of vital equipment and utilities that may impact on patient care, VA employee safety or contractor safety.

13. Ensures the security of the construction site is maintained, and that signs are clearly posted to restrict unauthorized access.

I. Safety Manager:

1. Participates in OSHA's 30-hour construction safety training and refresher courses.

2. Ensures that VHA policy for the construction safety program is implemented within the VAPHS.

3. Ensures necessary and relevant ILSMs (Interim Life Safety Measures) are established and implemented. Conducts required additional training for compliance with identified ILSMs.

4. Renders technical advice and assistance as required in connection with life safety and fire protection issues during construction and project design and development.

5. Oversees compliance with OSHA and other relevant construction safety regulations.

6. Insures veterans affairs medical center (VAMC) staff receives training required by this memorandum.

7. Insures the construction safety program includes appropriate periodic construction site hazard surveillance.

8. Serves as the delegation of authority to immediately stop any observed construction activity that may pose an imminent danger. Such actions require an immediate notice to the CO and project manager.

J. Infection Control Program Manager:

1. Participates in OSHA's 10-hour construction safety training program and refresher courses.

2. Advises and/or provides recommendations on exposure mitigation and the prevention of facility associated infections in patients, staff, and visitors.

3. Ensures infection control staff participates in the pre-construction briefings and other forums to review safety responsibilities, contractor safety plans and VA safety requirements associated with the project.

4. Coordinates with the manager of each construction project (in-house and contract) to conduct an Infection Control Risk Assessment (ICRA) during the planning and/or design stage of the work. ICRAs must be documented in writing and focus on eliminating, or minimizing, the risk of infection during construction and renovation activities.

5. Monitors infection control during construction activities as indicated in ICRA for that project. Has the authority to immediately stop construction activity deemed to be a dangerous or potentially dangerous infection control issue (will immediately notify project COR of this action).

K. GEMS Coordinator:

1. Provides guidance on environmental issues during design stage.

2. Monitors contractor conformance to contract specifications, including environmental compliance and pollution prevention. The Supervisory Project Engineer or designee will give quarterly reports to the GEMS Committee to update the Committee on contractor compliance with environmental protection and pollution prevention standards.

I. The Construction Safety Committee (Multi-Disciplinary Team):

1. Meets monthly and files reports to the Environment of Care Safety Committee.

2. Determines the scope and depth of safety, infection control, environmental and security procedures appropriate for all construction work.

3. Develops threshold criteria for each level of intervention. For example, after review, some projects may require only VA CP surveillance to ensure employee safety and OSHA compliance, while other projects will require all disciplines to be involved.

4. Ensures submittals for contract construction or renovation work include the names, qualifications, and training dates for the contractors' CPs designated to administer the site-specific safety program, as well as the CPs for other activities as required by OSHA regulation (such as scaffolds, cranes, excavations, etc).

5. Conducts Infection Control Risk Assessments (ICRA). Using the current American Institute of Architects (AIA) Guidelines, the staff must conduct and document ICRA for all construction projects during the design or planning stage of the work. ICRAs must be documented in writing and focus on eliminating, or minimizing, the risk of infection during construction and renovation activities. The complexity of the ICRA report is determined by the complexity of the threats posed by the construction project. Assigned VA staff, including resident engineers or project managers for major construction, must maintain compliance during the construction phase of the work.

6. Identifies Interim Life Safety Measures (ILSMs). Facility safety and engineering staff must ensure that ILSMs are implemented on all construction work in accordance with The Joint Commission Environment of Care standards. ILSMs are required when construction activities pose significant temporary Life Safety Code deficiencies or hazards. The VA Pittsburgh Healthcare System has a local policy addressing ILSMs in accordance with The Joint Commission requirements. Implementing ILSMs is the responsibility of the local medical facility and construction contractors in accordance with VA Master Specification 01010, General Requirements.

7. Participates in all phases of construction work from planning through completion. This includes review and approval the construction plans, contract specifications, and contract submittals related to construction safety and health and any other documents that may assist in the implementation of an effective construction safety program. The Construction Safety Committee must be involved early in the process and continue oversight on a regular basis to avoid costly and disruptive delays.

8. Ensures the construction safety program includes periodic construction site hazard surveillance activities with appropriate membership, scope, and frequency for each project as determined by the CP, the ILSMs and ICRA reports. Hazard surveillance activities must be documented as to date, time, membership of the inspection team, deficiencies, type of corrective action, and time and date of correction. Ensures corrective actions are tracked to completion.

9. Implements procedures to ensure general contractors exercise their responsibility for ensuring subcontractors comply with this safety and health policy, and all other related contract requirements.

10. Ensures all contractors entering VA property comply with the security management program. As a minimum, contractors must notify and obtain permission of the VA Police, be identified by project and employer, and be restricted from unauthorized access.

11. Requires the contractors' CPs to implement and maintain effective safety programs that identify and control hazards that may cause injury or illness to VA patients, staff, visitors, and contractor employees.

12. Evaluates the effectiveness of the construction safety program in an annual report to the facility safety and/or environment of care committee, or equivalent committee.

M. Police and Security:

1. Insures all contractors entering VAMC property comply with the security management program. At a minimum, contractors must notify and obtain permission of the VAMC Police, be identified by project and employer, and restricted from unauthorized access.

2. Conducts periodic surveillance of site security and the integrity of barriers for trenches and other hazards.

N. Environmental Management Service (EMS)

1. The EMS Environmental Sanitation section provides housekeeping services to all areas of the facility while cleaning to prevent the spread of infection. They collect, remove and properly dispose of trash and infectious waste.

2. Participate in post-construction survey along with COR, project manager, safety/infection control staff and others to identify cleaning needs.

3. Ensure that proper cleaning of a post-construction area is performed in a proper timely manner.

O. The contractor is responsible for:

1. The contractor, including all subcontractors, is directly responsible for the health and safety of their employees and the protection of the work environment. All contractor and subcontractor personnel are responsible for compliance with applicable local, state, federal and VA safety and health regulations to include OSHA and EPA regulations.

2. All contractor and subcontractor personnel must participate in a pre-construction process education for Infection Control that includes:

a. Basic Infection Control principles related to construction that must be in place to protect our patients.

b. Risk to patients and possible consequences related to construction activities for patients.

c. The importance of containment of construction areas including maintaining negative air pressure if required and proper containment of sites.

d. Tuberculosis transmission and prevention.

3. Acceptable education sources include:

a. VAPHS Construction Safety DVD.

b. ECRI Institute Risk Assessment (ICRA) for Healthcare Construction Certification.

c. Pittsburgh Carpenters Union 8-Hour ICRA 24 Training: Best Practices in Healthcare Construction.

d. Other programs attended to be reviewed by Infection Prevention upon request.

4. Providing documentation clearly showing the experience and training of the contractor's supervisory personnel, and indicating they are qualified as a competent person to properly supervise and maintain job site safety.

5. Conducting daily/weekly site safety inspections and maintaining documentation of such inspections and actions taken to abate deficiencies and unsafe conditions as required by the contract or at the request of the CO. (Note: The CO shall provide the contractor the appropriate inspection form as developed by the VA Pittsburgh Healthcare System.)

6. The contractor is responsible for obtaining Burn Permits as needed. The burn permits are to be issued on a day by day basis. They can be obtained from the COR.

7. The contractor shall submit a Waste Management Plan. This shall be submitted to the Medical Center prior to any waste removal. The plan shall contain the following:

a. Analysis

b. Proposed Alternatives to Land Filling

c. Methods of Handling Materials to be Recycled

d. Procedures

e. Landfill Options to include the names of the landfills

f. Transportation to include a description of means whether site-separated or self-hauled

g. Waste Management Plan Implementation, which includes a Waste Management Progress Report including material of land

filled from project, identity of landfill, total amount of tipping fees paid at landfill and total disposal costs

V. REFERENCES

VHA Emerging Pathogens Guidebook, 1998, Center for Engineering and Occupational Safety and Health available electronically at: http://vaww.ceosh.med.va.gov
National Fire Protection Association (NFPA) Standards
Note: Current NFPA Standards are available at facility and/or VISN Safety and Engineering and/or Facilities Management Offices.
APIC Infection Control Tool Kit Series: Construction and Renovation, available from the Association of Professional Infection Control Practitioners and Epidemiologists (APIC).
Guidelines for Design and Construction of Hospital and Health Care Facilities, American Institute of Architects, Washington DC
Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health, Bureau of Environmental and Occupational Disease Epidemiology, at: http://www.lchd.org/environhealth/aq/pdfs/NYC DOH Guidelines.pdf
Infection Control during Construction. A Guide to Prevention and The Joint Commission Compliance, Wayne Hansen, Editor, Opus Communications
OSHA Regulations for Construction Safety, 29 CFR 1926, available at: http://www.osha.gov
Current Standards of The Joint Commission.
VHA Directive 7701, Occupational Safety and Health
VHA Handbook 7701.1, Occupational Safety and Health Program Procedures
VA Directive 7700, Occupational Safety and Health
Construction Safety Council, at: http://www.buildsafe.org
VHA Directive 2011-036, Safety and Health during Construction Activities

VI. RESCISSION

Memorandum EC-051, dated December 20, 2005
Memorandum EC-043 dated October 15, 2009.
Memorandum FMS-003 dated March 14, 2011.

VII. CONCURRENCES

001, 11, 002, 00B, 05, 11D, All Service Lines VPs, AFGE Local 2028 and AFGE Local 3344

VIII. EXPIRATION

This memorandum automatically expires on February 21, 2016.

//Signed//
TERRY GERIGK WOLF, FACHE
Director and CEO

Attachments:
A. Pre-Construction Meeting Checklist
B. Contract Worker's Safety Information
C. Interim Life Safety Measures (ILSM)
D. Infection Control and Safety/Health Guidelines for Construction and Removal
E. Preconstruction Risk Assessment for Construction Compliance

Pre-Construction Meeting Checklist

Items of Discussion:

1. Which items were accepted? Verify that there is an agreement between the contractor and the VA regarding which of the alternatives were accepted.
2. Labor Disputes (FAR 52.222-1).
3. Monthly Progress Payments (FAR 52.232-5).
4. Differing Site Conditions (FAR 52.236-2). All smoke and/or dust barriers will be in place and approved by infection control and safety prior to beginning any demolition or construction work.
5. Completion of Infection Control Risk Assessment (ICRA) Matrix of Precautions for Construction.
6. Superintendence by the Contractor (FAR 52.236-6). Must have full authority to act for the contractor.
7. IC Permit Obtained.
8. Cleaning Up (FAR 52.236-12).
9. Accident Prevention (FAR 52.236-13).
10. Specifications and Drawings for Construction (FAR 52.236-21).
    a. Specifications govern over drawings.
    b. Work done without approved submittals shall be at contractor's risk.
11. Changes (APR 19840). No oral order shall be considered as a change.
12. Inspection of Construction (FAR 52.246-12).
13. Specifications and Drawings for Construction (VAAR 852.236-71). Drawings are not to be scaled.
14. Daily Report of Workers and Materials (VAAR 852.236-80). Weekly pay statement. Documentation required for apprentices.
15. Schedule of Work Progress (VAAR 852.236-84).
16. Workman's Compensation (VAAR 852.236-86).
17. Parking Regulations.
18. Hauling Demolition Material. Loads must be covered. Trucks must be equipped with a tailgate.
19. Receiving of Contractor Shipments by Government Employees.
20. Asbestos removal.

21. Use of Government Ladders. Under no condition is the contractor authorized to use government ladders.
22. Smoking. No smoking in any building on station. Mechanical rooms and contractor occupied areas are no exception.
23. Material Safety Data Sheets. Contractor must provide MSDSs for all applicable materials that are brought onto the job site.
24. Safety. Safety of the contractor's personnel is the contractor's responsibility. VA will not intervene except when the safety of VA personnel or property is at risk.
25. Fire stopping shall be provided for all penetrations in vertical and horizontal smoke partitions.
26. Hot Work Permits are required for all hot work.
27. Fire Safety during Construction.
    a. The contractor shall manage the work and schedule material arrival in a manner to result in a minimum of combustible material stored in the building at any one time.
    b. Under no condition will fire exits or other means of egress be blocked or partially blocked.
    c. Housekeeping/cleanup requirements shall be rigorously adhered to. All construction debris shall be removed from the building prior to the end of each shift.
    d. Smoking rules shall be strictly observed.
    e. The fire alarm system may not be disarmed or disabled in any way unless an equally effective alternative fire alarm system is provided.
    f. All construction partitions shall be non-combustible and smoke tight. Fire and smoke barriers will be constructed prior to any penetrations, and then sealed to meet appropriate codes.
28. Lock Out/Tag Out Energy Control Program shall be observed by all contractor personnel. Contractor is to submit a copy of their policy for approval.
29. Working in Confined Space shall be observed by all contractor personnel. Contractor is to submit a copy of their policy for approval. Contractor must obtain a permit prior to conducting any confined space work.

Contract Worker's Safety Information

Contract Reference

The VA Pittsburgh Healthcare System is a full service medical center with inpatients, outpatients, and staff who can be affected by what you do while working here. Many of these patients may have health problems that make them more susceptible to materials used or generated in your work.

In the event of a fire (Code Orange), remember RACE. Rescue persons in immediate danger, pull the fire Alarm and Contain the fire by closing any doors. If it is safe to do so, and you have been trained, try to Extinguish the fire with a portable fire extinguisher. If you do not hear the alarm sound, call ext. 911 to report the location. Know the location of the fire alarm and extinguisher in your work area.

Keep all dust and odors within the construction or maintenance site. All Material Safety Data Sheets (MSDS) for materials must be posted. Provide MSDS to the Contracting Officer's Technical Representative COR).

Asbestos. Assume that any sprayed-on fireproofing and thermal insulation contains asbestos. Ceiling tiles provide the barrier between the asbestos in the interstitial and the occupied areas below. Interior walls provide a similar barrier to asbestos fireproofing on vertical columns.

Ceiling tiles cannot be moved or displaced without proper containment and personal protective equipment. Wall penetrations cannot be made without proper containment and personal protective equipment. Immediately report all disturbances of asbestos-containing materials to your supervisor and the COR.

Hazardous Waste. The VA Pittsburgh Healthcare System indicates waste that is hazardous with different colored bags:

- RED for infectious or biohazardous waste.
- YELLOW for chemo waste.
- CLEAR & BLACK for general waste.
- Signs on containers also indicate whether the contents are biohazardous, radioactive or cytotoxic.
- DO NOT TOUCH THE CONTENTS OF ANY OF THESE CONTAINERS.

Hazardous Spills. Locate the MSDS and contact the Facility Management Service:

a. <u>Normal Administrative hours (7:00 am – 3:30 pm)</u>

1. If the spill is a small quantity, can be cleaned up by the employee who works in the area where the spill occurred, and safety is not jeopardized, the service employee can clean up the spill.

2. If employee's health and safety is jeopardized, the spill will be cleaned up by the Spill Team.

3. Contact the Safety Office/Spill Coordinator at 412- 360-3705, (Cell# 412-310-2824) or 606138. The Safety Office may also be contacted at Highland Drive, 544899 (Pager "12" 4190) for incidents at that facility.

b. After Administrative Hours (3:30 pm to 7:00 am)

1. If the Industrial Hygienist/Spill Coordinator is unavailable or for days and times (Monday-Friday) 4:00 pm to 7:30 am) and on weekends, notify the facilities operator by dialing 911. A Chemical Spill/Release Response Chain Call system has been established.

Utility Shutdown. You must notify your supervisor and COTR for approval: (7 day advance approval is required with appropriate time for hospital notifications)

- Prior to lock out/tag out of any utility system.
- If a utility failure occurs.
- Prior to restoring a system.

Smoking. Smoking is not allowed in any building and only in designated outdoor areas.

Patient Care Areas. Before entering a patient care room, receive permission and instructions from the nurse in charge. Respect the privacy of all patients. Remember, the patients at VAPHS are veterans who have served to protect our country.

Your Project Manager (COR) is _____, ext.

The Safety Officer is_____, cell 412-954-4899

Police and Security can be reached at extension 412-360-6911.

Employee Name/ Signature _____Date:_____

Contractor Pre-Construction Checklist

Date:_____
(Enter Facility Name)
Project No: _____ Contract No: _____
Project Name:_____

Smoking:
Non-smoking facility Smoking only permitted in designated areas.

Welding/Soldering/Sprinkler Work:
Any welding/soldering will require a permit. Fire alarm & fire pump shall be put in BI-Pass during sprinkler work.

Transmittal Correspondence:
All correspondence shall have project no., project name and contract no., sequentially numbered and dated.

Submittals:
The VA will retain two (2) submittals.
Contracting Officer shall receive Letter of Transmittal.
All submittals shall be in original form as required by the contract.
Submittals shall be sequentially numbered. If return of submittal is required, the submittal shall be labeled with an alpha character determined by the number of submissions, i.e., A, B, C, etc.
All (MSDS) Material Safety Data Sheet information.

Parking:
Project Manager shall issue temporary parking permits required for all vehicles. Park only in designated areas.

ID Badges:
Temporary personnel identification badges shall be required for the duration of the contract. Project Manager shall issue forms. Lost badges will be replaced at contractor's expense. Badges must be visible at all times for security measures.

Daily Logs:
Daily logs shall be complete and submitted weekly. One (1) original is required.
(RFI) Request For Information:
Shall be submitted in sequential order.

VA Primary Contact:
Mr./Ms._____ Phone:_____
Fax:_____Location:_____

VA Contracting Officer Contact:
Mr./Ms._____ Phone:_____ Fax:_____
Location:_____

Hazardous Materials on Site:
(Complete as necessary).

Submit Within First 10 Days:
- Progress Chart (see example).
- Submittals (copy of transmittal sheet to Contracting Officer).
- Cost Breakdown on Contract Progress Report (Form 08-6001a).
- List of Subcontractors.
- Material Safety Data Sheets (if applicable).
- Copy of Contractor Certification or Permit (if applicable).

Forms: (VA Common Electronic Form Index)
- After Hour Request (Security).
- Confined Space Entry. (if applicable)
- Construction Worker Introduction.
- Contractor Cutting, Welding and Soldering Permit.
- Contractor ID Badge Request Form.
- FMS Contractor Key Agreement Letter
- Contractor Parking Permit Request.
- Daily Log.
- Life Safety Measures.

For Payment: (Original and 2 copies)
- Progress Payment Sheet (use enclosed format).
- Payrolls.
- Daily Logs (submitted weekly to Project Manager).
- Updated Progress Chart (if applicable).
- Cost Breakdown and Contract Progress Report (Form 08-6001a, front and back).

Final Inspection:
- Notify Project Manager 15 days prior to date or contract completion date.
- Submit redline as built drawing set.

Clean area completely.

Contractor Life Safety Measures

FIRE: Locate Pull Stations.
Phone ext. 911 to report.
Know evacuation routes & fire codes in adjacent areas.

FUMES: Have MSDS sheets on site.
Phone Industrial Hygienist, 412-360-3705.

LEAKS: Contact Project Manager.
Phone ext. 816138 to report.

DUST: Non-combustible barriers around project sealed.
Negative air to outside.

OSHA: Comply with all guidelines.

HINDSIGHT: Impacts to facility.
Employee relocations.
Shutdowns.

PREVENTIVE TRANSFERENCE OF BLOOD PATHOGENS:
Wash hands, clean shoes prior to leaving work area.
Clean work area daily.
No exposures outside dust barriers.

After Working Hours Activity Security Form

Date: _____
Hours: _____ - _____

There will be activity after working hours by the following Contractor(s):
_____
_____
_____

Located in: Bldg #_____; Floor # _____; Wing _____; Room #_____

The following persons will be involved:
1. _____
2. _____
3. _____
4. _____

Superintendent in Charge: _____
Phone:_____
Pager:_____
Cell Phone:_____

You are directed to check in and out in Room-xxxx, with the medical center Police, who will assist as necessary.

_____, Project Manager
Cell phone:_____

APPROVED: _____, Police/Security, 412-360-6911

Special Instructions: Open locked doors as required.

Contractor ID Badge Request Form

(Please print all information.)

Date:_____

Name of Contract:_____

Contractor:_____

PLEASE PROVIDE THE FOLLOWING INFORMATION FOR ISSUANCE OF CONTRACTOR ID BADGE: (Must have a valid photo ID/State Driver's License).

A. NAME:_____

SOCIAL SECURITY NUMBER: _____ _____ _____

B. NAME OFCOMPANY:_____

C. PHONE NUMBER(S): _____

D. EXPIRATION DATE OF CONTRACT (provided by VA) _____

ID BADGES ARE ISSUED MONDAY THRU FRIDAY (8 A.M. TO 4 P.M.)
Complete this form and take to the VA Police Office, (insert VA Police location and phone extension).

You will be required to wear your issued ID Badge, above the waist, at all times while working on medical center property.

If your issued ID Badge is lost, you will be charged $25.00 for a replacement.

Approving Official:
Print Name: _____

Signature:_____

FMS CONTRACTOR KEY AGREEMENT LETTER

NAME	COMPANY/COR	KEYS ISSUED	QTY

I, the undersigned, acknowledge receipt of the keys designated above, and the terms below:

(1) I agree not to loan, transfer or give possession of the keys to Any employee or subcontractor, or misuse, modify or alter the keys in any way; _____ init

(2) I agree not to cause, allow or contribute to the making of any unauthorized copies of the above keys; _____ init

(3) I agree not to allow any engineering mechanical or electrical doors to be propped open. _____ init

(4) I agree not to store any materials in the engineering mechanical or electrical rooms. _____ init

(5) I agree this key will remain in the control of the Contractor Superintendent/undersigned at all times; _____ init

(6) I agree to immediately report a lost or missing key to the Contracting Officers Representative (COR) for the project and further understand I can be help financially accountable for the loss, and any expenses to rekey affected areas due to the loss. _____ init

I understand if the VA finds the contractor non-compliant with these requirements, the VA will have the key removed from the contractor and they will be required to sign the key out daily through the Contracting Officers Representative (COR) for the remainder of the project.

Printed Name_____

Signature_____

Date_____

Request for Contractor Parking Permit Form

Submit the following information:

1. Name of Operator: (Print) _____
2. Name of Company: _____
3. Company Phone Number: (_____)_____
4. License Number of Vehicle: _____
5. Make of Vehicle: _____
6. Model and Year: _____

Signature of Requestor: _____

Note: This permit is only valid for the vehicle listed above. Parking is only permitted (insert contractor parking location).

Place permit on the driver side, lower left corner of windshield. If permit expires, it is your responsibility to renew this permit. It is recommended that you renew your permit two (2) weeks ahead of expiration date.

VA Use Only:

Date of Issue: _____

Date of Expiration: _____

Permit Number: _____

VA PITTSBURGH HEALTHCARE SYSTEM
INTERIM LIFE SAFETY MEASURES

1. Life Safety deficiencies are identified through a program of periodic inspections, including:

    a. Environment of care rounds and periodic focus inspections to identify deficiencies with building features such as door hardware (closers, latching); exit signs and proper operation of linen and trash chutes.

    b. Periodic unannounced inspections of construction and service areas to verify sealing of penetrations through barrier walls.

    c. Weekly safety inspections are conducted by the Contracting Officer Representative (COR) in all construction areas.

    d. Unannounced inspections of construction areas are conducted by VAPHS Safety Specialists.

    e. A full facility inspection, including complete inspection of smoke barrier walls – outside wall to outside wall and slab to slab, is conducted by a fire protection engineering firm at least once every three years.

2. Reports of life safety deficiencies not related to construction projects are reviewed by the Safety Manager or designated Safety Specialist (fire protection).

    a. Insignificant deficiencies are items that can be resolved within 45 days of date of the inspection report, and do not involve items listed as “significant deficiencies” on the ILSM determination matrix, Column A. Neither an ILSM evaluation nor a plan for improvement is required for insignificant deficiencies.

    b. If an insignificant deficiency cannot be corrected within 45 days of the date of the inspection report, OR IF THE DEFICIENCY IS ONE THAT IS IDENTIFIED AS A SIGNIFICANT DEFICIENCY on the ILSM determination matrix, Column A, an ILSM evaluation will be conducted and appropriate interim life safety measures will be required and implemented.

3. ILSM evaluations will be conducted for all construction projects.

4. The decision of which Interim Life Safety Measures are appropriate for implementation will be made by following The Joint Commission guidance on this topic and by using the ILSM decision matrix. This matrix lists Interim Life Safety Measures that are recommended – but not mandatory - for specific types of deficiencies.

An Interim Life Safety Measures form will be completed by the Specialist or Manager and maintained in the Safety Department Share Drive. Documentation that supports implementation of the required interim life safety measures will also be maintained in that file.

NOTE: For purposes of ILSM evaluations, the terms multiple and extended periods are not specific. Need for ILSMs is evaluated on a case by case basis.

5. Interim Life Safety Measures that may be implemented include:

   a. When exits are impacted by construction, alternate exit routes will be checked on a frequent basis. If the closure leaves two exit routes available, those routes will be inspected by the safety office staff. Inspections will be conducted, to the extent possible on Monday - Friday (excluding holidays). In rare circumstances, conditions may require that alternate exit routes be inspected 7 days a week. For example, if closure of an exit leaves only one exit route open and the affected area is occupied seven days a week. The alternate exit may need to be inspected seven days a week.

   b. When a complete fire alarm system is taken out of service for a zone, or if all manual pull stations in a zone occupied by health care system is taken out of service, interim measures will be implemented. If the outage is extended, the interim measure will consist of a fire watch and if the zone is occupied staff will be trained on alternate methods to report a fire. Based on the expected duration, a temporary fire alarm system may need to be provided. Details of the temporary system, including devices to be installed and device placement, will be approved by the Safety Manager (or designee) before installation. Temporary systems shall be tested not less than monthly.

   c. When a sprinkler system for a zone is taken out of service a fire watch will be implemented. If the outage occurs in a construction area, contractors are required to bring portable fire extinguishers into the area. Presence and condition of these extinguishers shall be checked periodically by safety office staff during unannounced inspections of construction areas. If the outage occurs in a hazardous area such as bulk storage or hazardous chemical storage and is expected to extend outside of normal business hours on any given day, the Safety Office will provide additional temporary fire extinguishers for the area.

   d. When construction is performed in buildings that are jointly occupied by VA staff, patients and visitors, temporary construction partitions shall be constructed to separate the construction area from all other areas.

1) Construction partitions shall be smoke tight and shall be constructed of noncombustible or limited combustible material that will not contribute to the development or spread of fire. These smoke tight noncombustible partitions shall extend above ceiling to assure that smoke will not migrate above ceiling from the construction area to other areas of the building. Integrity of the partitions will be inspected by the project COTR during routine construction area inspections and by the safety office during unannounced inspections of construction areas.

2) Partitions constructed of fire retardant plastic may be used in limited short term situations, subject to the following limitations:
   a) Use of the fire retardant plastic barrier shall be approved by the VAPHS Safety Manager (or Acting Safety Manager).
   b) Time limit for use of the fire retardant plastic barrier is 48 hour maximum.
   c) Fire retardant plastic with non-combustible or limited combustible bracing shall be used to construct the barrier. Fire retardant plastic shall meet the requirements of ASTM E-84 for flame spread and smoke development. Documentation showing the characteristics of the material shall be provided to the VAPHS Safety Manager for approval before the barrier is constructed.
   d) No hot work is permitted within 25 feet of the barrier (inside or outside the barrier)

e. When sprinkler systems are out of service, fire watches will be conducted to increase hazard surveillance and minimize risk that fire will occur or spread before intervention can occur. Increased hazard surveillance will also occur when areas are under construction. The COTR for each project will conduct inspections to insure the hazards are not present – or that they are quickly corrected if any should be noted. Examples of hazards that are identified and acted on during hazard surveillance include accumulations of debris, or improper storage – materials not stored in established storage rooms, mixing of flammable and combustible materials, or storing of flammables outside of approved storage cabinets/rooms. Safety Specialists from the Safety Office will also conduct periodic unannounced inspections of construction and adjacent areas to assure that hazards are identified and abated.

f. When a sprinkler system for a zone is taken out of service a fire watch will be implemented. If an extended sprinkler outage occurs in an area occupied by VAPHS staff, a designated Safety Specialist will visit the area and provide a refresher on use of fire extinguishers located in the area

g. When construction projects or identified life safety deficiencies in a building impact any of the following situations in patient care buildings, additional fire drills may be conducted in the building. Drills will be conducted at the rate of two per building per shift per quarter in the occupied building during construction. If significant life safety deficiencies not associated with construction are identified and cannot be corrected within 30 days, additional drills will be implemented. Additional drills will continue until the construction is completed or the deficiency has been corrected.

    - Sprinkler system out of service for extended period
    - Fire alarm system out of service for extended period
    - Improperly protected vertical openings
    - Lack of required smoke barrier
    - Large or multiple penetrations in existing smoke barrier
    - Exits blocked
    - Design of area results in less than two remote exits
    - Addition to existing building without proper fire separation between existing and addition
    - Corridor walls to not terminate at smoke tight membrane
    - Multiple door hardware defects within a single smoke zone

h. Additional training shall be provided to staff when construction or existing life safety deficiencies occur in any of the following "significant deficiency" categories. Training shall include a review of the life safety condition that exists, additional actions being taken by the organization to insure safety of occupants and expectations for staff action to insure safety of occupants. For example if exits are closed because of construction, training will include a discussion of alternate exits. Training may be provided as part of additional fire drills (if required) or as part of separate informal training sessions in the affected areas. Circumstances where additional training will be provided include:

    - Blocked exits or lack of two remote exits
    - Sprinkler system out of service for extended periods
    - Fire alarm system out of service for extended periods
    - Large or multiple penetrations in smoke barriers, OR lack of a required smoke barrier

6. The Safety Manager will present a monthly report to the Safety/EOC Committee of all interim life safety measures that were implemented in the current month.

GUIDANCE FOR DETERMING APPROPRIATE INTERIM LIFE SAFETY MEASURES

COLUMN A Significant Life Safety Code Deficiencies in Existing Buildings or Conditions that Occur As a Result of Construction.	Additional training on extinguishers	Ensuring egress (inspections of routes)	Temporary fire alarm with monthly test	Emergency Forces Access	Emergency Forces Notification	Ensuring Operational life safety systems	Temporary construction barriers	Additional Fire fighting equipment	Prohibiting Smoking	Controlling combustible loading	Conducting 2 fire drills per shift in all areas	Increased hazard surveillance	Compartmentation training for personnel	Conducting organization training on life safety
Nonconforming building construction				X				X	X	X	X			X
Sprinkler system out of service for extended period	X			X	X	X		X	X	X	X	X		X
Fire alarm system out of service for extended period			X		X	X			X		X			X
Improperly protected vertical openings									X	X	X			
Lack of code complying smoke barrier		X		X					X		X		X	
Large or multiple penetrations in fire/smoke barriers		X							X		X		X	
Exit blocked		X							X	X			X	
Lack of two remote exits		X							X	X			X	
Fire exit stairs lack proper exit discharge		X				X			X		X		X	X
Major renovation of an occupied bldg.		X		X								X		

Improperly protected hazardous area									X			X		
Addition to existing building without fire separation				X	X	X	X		X	X	X			
Corridor walls not to smoke tight membrane									X			X		
Multiple door hardware defects in smoke zone									X			X		

INFECTION CONTROL AND SAFETY/HEALTH GUIDELINES FOR CONSTRUCTION AND RENOVATION

I. PURPOSE

The purpose of this attachment is to prevent the acquisition of hospital-acquired infections in patients and to decrease the risk of exposure of employees, visitors, and contractors, to potential infections, safety and other health hazards during renovation or construction activities at the VA Pittsburgh Healthcare System. In addition, to establish procedures and programs for proper management and remediation of any mold found inside the VAPHS.

II. RESPONSIBILITIES

A. Medical Center Director will assure that all project coordinators, engineers and Vice President Facilities Management (VP FMS) apprises the Infection Control nurse and the Safety Office of plans for all projects involving construction and/or renovation of clinical and non-clinical areas in the medical center.

B. Supervisors are responsible to inform Infection Control and/or the Safety Office of employee concerns for potential mold growth.

C. Infection Control Nurse, the Safety Office, and/or Project Engineering is responsible for:

1. Upon request, conduct an assessment for the existence of mold, or moldy building materials.

2. Specify appropriate removal procedures and provide infection prevention and control recommendations for mold/moldy building materials during construction and renovation projects. Guidelines established by CDC, EPA, and OSHA will be used.

3. Notify Facilities Management and Employee Health of areas of mold concerns.

4. Notify employees in the area of the status of mold concerns

5. If applicable, report to the Safety Committee, the status of mold issues and the impact of employees.

6. Complete Appendix B, Mold Remediation Risk Assessment to determine proper remediation techniques and precautions to be applied.

7. The Project Engineer will issue the Infection Control Construction Permit.

8. Monitor and response to safety and hazard related issues during construction and renovation projects.

D. Facilities Management (Environmental Management and Maintenance and Repair) employees are responsible to:

1. Report all suspect mold to Safety and/or Infection Control.2. Follow approval mold removal procedures as recommended by Safety and/or Infection Control.

2. Follow approved mold removal procedures as recommend by Safety and /or Infection Control Nurse.

3. Use the attached Infection Control Construction Permit (Attachment D, page 12 of 18) for any Mold Remediation Activity that qualify as Type C or Type D, and for Type B activities in the highest risk areas, as designated on the Risk Assessment, Appendix B.

E. Contractors shall comply with VHA Directive 2011-036 Safety and Health during Construction. Construction workers at VAPHS were determined to be at risk for the transmission of Tb based on the Pre-Construction Risk Assessment and the following must occur:

1. The contractor must provide written certification to the COR that all contract employees assigned to the work site have had pre-placement tuberculin screening within 90 days prior to assignment to the worksite and found to have negative Tb screening reactions.

2. The contractor will be required to show documentation to the COR for additional workers assigned after the 90 day requirement before they will be allowed to work on the work site.

3. This testing may be two-step skin testing or a Food and Drug Administration (FDA) approved blood test such as the Quantiferon Gold Test.

4. Contract employees manifesting positive screening reactions to the tuberculin must be examined according to current CDC guidelines prior to working on VHA property

5. If the worker is found without evidence of active pulmonary Tb, a statement documenting examination by a physician must be on file with

the employer (construction contractor) noting that the employee with a positive tuberculin screen test is without evidence of active Tb.

III. PROCEDURES:

A. Planning Phase

1. Infection Control and the Safety Office will participate in the project pre-construction meeting.

2. Infection Control and Safety Officer will be involved in the planning phases for all renovation and new construction projects and have input specific to the following major components (design):

a. Number and placement of isolation rooms

b. Air handling systems; use of adjunctive measures such as ultraviolet germicidal irradiation (UVGI) and appropriate filtration systems

c. Number and placement of hand washing facilities

d. Staff and patient traffic patterns for the duration of the project.

e. Relocation decisions regarding patient care areas, storage areas, etc.

f. Water supply and plumbing

g. Number and placement of eye-wash, shower, hazardous chemical or compressed gas facilities.

h. Construction waste containment, transport and disposal

i. Selection and installation of medical equipment as it relates to infection control.

j. Selection of finishes and surfaces that can be effectively cleaned.

3. Renovation projects in-house may also be done by our employees. Mold Removal Guidelines (Attachment D, page 16 of 18) will be used for these projects. Portions may also be used for larger projects requiring outside contractors.

4. The Project Engineer, with the assistance of the Infection Control Nurse will complete the Risk Assessment (Attachment D, page 8 of 18) and Construction Permit (Attachment D, page 12 of 18). The Permit is then signed by the Project Engineer, Infection Control Nurse, the contractor, and/or the VA MIT/M&R.

B. Operational Phase

1. Medical Waste

a. Environmental Management Service staff shall remove any medical waste, including sharps containers, from areas to be renovated or constructed BEFORE the start of the project.

b. Infection Control shall be notified immediately if unexpected medical waste is encountered.

c. Environmental Management Services will do appropriate cleaning of all areas prior to the start of the project and at the completion of the project.

2. Barrier Walls: Construction or renovation sites must be separated from patient-care areas and critical areas such as SPD and Pharmacy by barriers that keep the dirt and dust inside the worksite.

a. The integrity of the barrier walls must assure a complete seal of the construction area from adjacent areas.

b. Rigid construction or fire-rated plastic sheeting (4 or 6 mil thickness) are used, depending on the location of the project, adjacent uses, and duration of the project.

c. Walls will be dustproof with seals maintained at the full perimeter of the walls, which allow for minimization of dust collection and spread.

3. Environmental Control

a. Negative air pressure and HEPA (High Efficiency Particulate Air) filter vacuum system rated at 95% capture of 0.3 microns will be implemented as needed within the construction zone, at the discretion of the Engineering Department and the Construction site manager.

b. Demolition debris will be disposed of into non-infectious waste trash bins and removed from the construction area daily, using specified traffic patterns. All waste bins will be tightly covered during transport outside of the construction site.

c. "Sticky" or walk-off mats shall be utilized immediately outside the construction zone and elevators to remove dust and soil from shoes, cart wheels, etc. as personnel exit the area. The "sticky" mat must be large enough to cover the entire exit and is changed whenever necessary, but at a minimum daily.

d. Exterior windowsills must be assured to minimize infiltration of outside excavation debris; Windows will remain closed as much as feasible during the construction/renovation process.

e. Control, collection and disposal must be provided for any drain liquid or sludge encountered when Facility employees or contractors are demolishing plumbing.

4. Traffic Control

a. Designated entry and exit procedures will be defined (in conjunction with any necessary Interim Life Safety Measures) for each construction project where applicable. To the extent feasible, the entry and exit procedures will be annotated on the contract drawings and explained during pre-bid and pre-construction meetings.

b. All egress pathways will be free of debris.

c. Unauthorized personnel will not be allowed to enter the construction zone.

d. Only designated elevators will be used for construction activities during scheduled times.

e. Construction areas will be fitted with self closing lockable doors and will remain locked at all times.

5. Cleaning

a. The construction zone and adjacent entry areas shall be maintained in a clean and sanitary manner by the

contractors and will be swept and wet mopped at the end of each day or more frequently as required.

b. Environmental Management Services will be responsible for the routine cleaning of adjacent areas including stairwells and for the terminal cleaning of the construction zone prior to the opening of the newly renovated or constructed area. Specific responsibility will be defined in the construction contracts.

6. Personnel Requirements

a. Clothing shall be free of loose soil and debris upon exiting the construction zone.

b. Personnel entering sterile/invasive procedure areas will be provided with a disposable jump suit, head covering and shoe coverings, which must be removed prior to exiting the work area.

1. Tools and equipment must be damp-wiped prior to entry and exit from sterile and invasive procedure areas.

2. Tools and equipment soiled with blood and body fluids will be cleaned with an approved germicide (e.g. Cavicide).

a. Facilities Management employees shall receive Infection Control and Safety and Health training as it relates to construction.

7. Environmental Monitoring - Infection Control, in conjunction with Facilities Management and Safety, will plan for environmental monitoring as appropriate for the project.

C. Completion Phase

1. The area will be thoroughly cleaned and disinfected by EMS before being placed into service.

2. The VA Plumbing shop will flush water supply lines before placing newly renovated or constructed areas into service. Infection Control, Safety Office and affected areas will be notified prior to the scheduled date for the flushing procedure.

3. Infection Control personnel shall certify that water supply lines are safe for use.

D. Compliance Monitoring

1. The Project Engineer or COR (Contracting Officer's Representative) will conduct weekly safety inspections.

2. Medical center staff (Project Engineer, Safety Manager, Industrial Hygiene, Infection Control) and the contractor will conduct compliance monitoring as necessary. The following parameters will be monitored:

a. Air quality
b. Integrity of barrier walls and floors
c. Infection Control
d. Noise
e. Traffic Control

VI. REFERENCES

Bartley, J. Construction and Renovation: APIC Text of Infection Control and Epidemiology, APIC, Inc. 2005

Guidelines for Environmental Infection Control in Healthcare Facilities - Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC), MMWR Vol. 43 (RR-13): 1-132

CAMH, CAMAC, CAMLTC, CAMBHC EC 3.2.1 2002 edition

OSHA Occupational Safety and Health standards 29 CFR 1910 and 1960
www.osha.gov/SLTC/indoorairquality/index.html

Joint Commission Environment of Care Standards

Centers for Disease Control (CDC) information on "Molds in the Environment"
www.cdc.gov/nceh/airpollution/mold/moldfacts.htm

State of the Science on Molds and Human Health – Stephen C. Redd, MD, Chief, Air Pollution and Respiratory Health Branch, National Center of Environmental Health, Centers for Disease Control & Prevention – US House of Representatives
www.cdc.gov/nceh/airpollution/images/moldsci.pdf

Mold Remediation in Schools and Commercial Buildings, EPA March 2001

RISK ASSESSMENT

PLANNING STAGE HAZARD ANALYSIS WORKSHEET

Rate Potential for Compromise on Scale of 5-1

5 being the highest possibility of occurrence or the weakest resources

1 being the least likely to occur or the strongest resources

List Type of Construction Activity:

(New Construction/Renovation/Demolition)

_____

Potential Compromise to:	Potential for Compromise	List Patient Care Areas Impacted	List Non-Patient Care Areas Impacted	List Public Access Areas Impacted	List Control Activities Needed
Air Requirements		_____ _____ _____	_____ _____ _____	_____ _____ _____	1. ____ 2. ____ 3. ____
Infection Control		_____ _____ _____	_____ _____ _____	_____ _____ _____	1. ____ 2. ____ 3. ____
Utility Failure - (Check Effected Utility) ❑ Communications/Telephone ❑ Electrical ❑ Generator ❑ Temperature ❑ HVAC ❑ Medical/Natural Gas ❑ Medical Vacuum ❑ Sewer ❑ Water ❑ Other: _____		_____ _____ _____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____ _____ _____	1. ____ 2. ____ 3. ____ 4. ____ 5. ____ 6. ____ 7. ____ 8. ____ 9. ____
Usual Noise Levels		_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	1. ____ 2. ____ 3. ____ 4. ____
Vibration Levels		_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	1. ____ 2. ____ 3. ____ 4. ____
Emergency Procedures (Check Effected Procedure) ❑ Fire Safety ❑ Emergency (Disaster) Management ❑ Security ❑ Other: _____		_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	1. ____ 2. ____ 3. ____ 4. ____ 5. ____ 6. ____

Infection Control Risk Assessment
Matrix of Precautions for Construction & Renovation

Step 1: Using the following table, *identify* the type of Construction Project Activity (A-D)

Type A	Inspection and Non-Invasive Activities Includes, but is not limited to: • Removal of ceiling tiles for visual inspection limited to 1 tile per 50 square feet. • Painting (but not sanding) • Wallcovering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings or other than for visual inspection.
Type B	Small scale, short duration activities which create minimal dust Includes, but is not limited to: • Installation of telephone and computer cabling • Access to chase spaces • Cutting of walls or ceiling where dust migration can be controlled
Type C	Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies Includes, but is not limited to: • Sanding of walls for painting or wall covering • Removal of floor coverings, ceiling tiles and casework • New wall construction • Minor duct work or electrical work above ceilings • Major cabling activities • Any activity which cannot be completed within a single workshift
Type D	Major demolition and construction projects Includes, but is not limited to: • Activities which require consecutive work shifts • Requires heavy demolition or removal of a complete cabling system • New construction

Note: Reference: "www.icanprevent.com"

Step 2: Using the following table, *identify the* Patient Risk Groups that will be affected. If more than one risk group will be affected, select the higher risk group:

Low Risk	**Medium Risk**	**High Risk**	**Highest Risk**
• Office areas	• Cardiology • Echocardiography • Endoscopy • Nuclear Medicine • Physical Therapy • Radiology/MRI • Respiratory Therapy	• CCU • Emergency Room • Labor & Delivery • Laboratories (specimen) • Newborn Nursery • Outpatient Surgery • Pediatrics • Pharmacy • Post-Anesthesia Care Unit • Surgical Units	• Any area caring for immunocompromised patients • Burn Unit • Cardiac Cath Lab • Central Sterile Supply • Intensive Care Units • Medical Unit • Negative pressure isolation rooms • Oncology • OR rooms including C-section rooms

Step 3:
Match the Patient Risk Group (low, medium, high, highest) with the planned **Construction Project Type** (A, B, C, D) on the IC Matrix to find the **Class of Precautions** (I, II, III, IV) or level of infection control activities required. Classes of precautions are described in the table on the next page.

IC Matrix: Class of Precautions for Construction Projects by Patient Risk

Patient Risk Group	Type A	Type B	Type C	Type D
LOW Risk Group	I	II	II	III/IV
MEDIUM Risk Group	I	II	III	IV
HIGH Risk Group	I	II	III/IV	IV
HIGHEST Risk Group	II	III/IV	III/IV	IV

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

Infection Control Construction Permit

Location of Construction:	Permit No:
Project Coordinator:	Project Start Date:
Contractor Performing Work:	Estimated Duration:
Supervisor:	Permit Expiration Date:
	Telephone:

YES	NO	CONSTRUCTION ACTIVITY	YES	NO	INFECTION CONTROL RISK GROUP
		TYPE A: Inspection, non-invasive activity.			GROUP 1: Low Risk
		TYPE B: Small scale, short duration, moderate to high levels.			GROUP 2: Medium Risk
		TYPE C: Activity generates moderate to high levels of dust, requires greater 1 work Shift for completion.			GROUP 3: Medium/High Risk
		TYPE D: Major duration & construction activities requiring consecutive work shifts.			GROUP 4: Highest Risk

Class 1	1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace any ceiling tile displaced for visual inspection.	3. Minor demolition for remodeling.
Class II	1. Provides active means to prevent air-borne dust from dispensing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Wipe surfaces with disinfectant.	6. Contain construction waste before transport in tightly covered containers. 7. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 8. Place dust mat at entrance and exit of work area. 9. Remove or isolate HVAC system in areas where work is being performed.
Class III Date: Initials: Initials:	1. Obtain infection control permit before construction begins. 2. Isolate HVAC system in area where work is being done to prevent contamination of the duct system. 3. Complete all critical barriers or implement control cube method before construction begins. 4. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 5. Do not remove barriers from work area until complete project is thoroughly cleaned by Environmental Services Department.	6. Vacuum work with HEPA filtered vacuums. 7. Wet mop with disinfectant. 8 Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 9. Contain construction waste before transport in tightly covered containers. 10. Cover transport receptacles or carts. Tape covering. 11. Remove or isolate HVAC system in areas where work is being performed.
Class IV Date: Initials: Initials:	1. Obtain infection control permit before construction begins. 2. Isolate HVAC system in areas where work is being done to prevent contamination of duct systems. 3. Complete all critical barriers or implement control cube method before construction beings. 4. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 5. Seal holes, pipes, conduits, and punctures appropriately. 6. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site. 7. All personnel entering work site are required to wear shoe covers.	8. Do not remove barriers from work area until completed project is thoroughly cleaned by the Environmental Services Department. 9. Vacuum work area with HEPA filtered vacuums. 10. Wet mop with disinfectant. 11. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 12. Contain construction waste before transport in tightly covered containers. 13. Cover transport receptacles or carts. Tape covering 14. Remove or isolate HVAC system in areas where work is being done. 15. Manometers required to visually monitor negative air flow In highest risk areas. Daily readings during construction to be manually recorded by the contractor.

COTR	Date	Infection Control Nurse	Date
Project Manager	Date	Contractor	Date

Description of Required Infection Control Precautions by Class

	During Construction Project	Upon Completion of Project
Class I	1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection.	
Class II	1. Provide active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Place dust mat at entrance and exit of work area. 6. Remove or isolate HVAC system in areas where work is being performed.	1. Wipe work surfaces with disinfectant. 2. Contain construction waste before transport in tightly covered containers. 3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 4. Remove isolation of HVAC system in areas where work is being performed.
Class III	1. Remove or isolate HVAC system in areas where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum or vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Contain construction waste before transport in tightly covered containers. 5. Cover transport receptacles or carts. Tape covering unless solid lid.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department and thoroughly cleaned by the owner's Environmental Services Department. 2. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 3. Vacuum work area with HEPA filtered vacuums. 4. Wet mop area with disinfectant. 5. Remove isolation of HVAC system in areas where work is being performed.
Class IV	1. Remove or isolate HVAC system in areas where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum or vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Seal holes, pipes, conduits, and punctures appropriately. 5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site. 6. All personnel entering work site area required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area. 7. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department and thoroughly cleaned by the owner's Environmental Services Department. 8. COR to monitor manometer readings to confirm negative pressure.	1. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction. 2. Contain construction waste before transport in tightly covered containers. 3. Cover transport receptacles or carts. Tape covering unless solid lid. 4. Vacuum work area with HEPA filtered vacuums. 5. Wet mop area with disinfectant. 6. Remove isolation of HVAC system in areas where work is being performed.

Adapted with permission of Virginia Kennedy and Bonnie Barnard, St. Luke's Episcopal Hospital, Huston, TX, www.icanprevent.com.

Water Distribution Sanitizing and Testing Report

All renovations and additions to the facility's water distribution lines must be sanitized prior to connection to the existing water system.

From CFM specification Section 221100 FACILITY WATER DISTRIBUTION:

3.3 STERILIZATION

A. After (leak) tests have been successfully completed, thoroughly flush and sterilize the interior domestic water distribution system in accordance with AWWA C651.

B. Use NSF approved liquid chlorine (or NSF approved) for sterilization.

Contractor shall:

A. Flush, sanitize and test newly modified lines prior to connecting to the existing distribution system.

B. Isolate all areas to be renovated from the existing system prior to demolition.

C. Provide a flushing and sanitizing plan to the COR for review and approval.

D. Provide a testing plan to the COR for review and approval.

E. Complete the following table and attach the bacteriological test report.

Date_____

Loc/Room Number 10% Point of Use					
Chlorination (PPM)					
Contact Time (HRS)					
Results					

Nearest point of use to supply source and most remote point of use must be bacteriological tested.

Positive bacteriological results must be retreated and retested.

Comments:_____

_____

_____

_____

Contractor Project Manager

_____ _____

Contracting Officer Representative Infection Control Nurse

Infection Control Orientation – Construction Service Workers

The goal of the Infection Control program is to identify and reduce the risks of acquiring and transmitting infections among patients, employees, physicians, and other licensed independent practitioners, contract service workers, volunteers, students, and visitors.

During construction, renovation and minor improvement projects, hidden infectious disease hazards may be released into the air, carried on dust particles or on clothing – for example, fungal organisms such as, Aspergillus. Aspergillus *species may be found in decaying leaves and compost, plaster and drywall, and settled dust. These organisms usually do not cause problems in healthy people, but a hospital is full of sick patients!* Aspergillus *and other fungal organisms can cause illness and even death in premature babies, transplant patients, cancer treatment patients, and patients with lung problems or poor immunity. Therefore, it is critical that you do your part to keep our patients, employees, and visitors as safe and healthy as possible. We, in turn, will make conditions as safe as possible for you.*

1. *Medical Waste:*
    a. *We will remove any medical waste, including sharps containers (for used needles and syringes), from construction areas prior to the start of the projects.*
    b. *If you (contract workers) find any needles, syringes, sharp medical objects, please notify Infection Control (x2916/3393)* ***IMMEDIATELY****.*

2. *Barrier Walls:*
    a. *The construction areas MUST be kept separated from patient care areas by barriers that keep the dust and dirt inside the worksite.*
    b. *The walls must provide a complete seal of the construction area from adjacent areas (walls may be rigid or 4 or 6 mil thickness plastic).*

3. *Environmental Control:*
    a. *Negative air pressure must be maintained within the construction area.*
    b. *Demolition debris is removed in tightly fitted covered carts – use specified traffic patterns.*
    c. *Sticky or walk-off mats are placed immediately outside the construction zone and changed whenever necessary to control the spread of dust and dirt.*
    d. *Exterior window seals are to be used to reduce the amount of outside excavation debris coming into the building.*
    e. *If demolition chutes are used, they must be sealed when not in use; the chute and damper should be sprayed with water, as necessary to maintain dust control.*
    f. *Control, collection and disposal must be provided for any drain liquid or sludge found when demolishing plumbing.*

4. *Traffic Control:*
    a. *Use designated entry and exit procedures.*
    b. *Keep all egress pathways free of debris.*
    c. *No unauthorized personnel should be allowed to enter construction areas.*
    d. *Use designated elevators only.*

5. *Cleaning:*
    a. *Keep the construction area clean on a daily basis.*
    b. *Dust and dirt **must** be kept to a minimum.*

6. *Workers:*
    a. *Clothing must be free of loose soil and debris when exiting the construction area.*
    b. *Use personal protective equipment (masks, face shields, etc.) as indicated for the task at hand.*
    c. *Handwashing is the best method of reducing the transmission of infection: always wash your hands with soap and water after visiting the restroom, before eating, when leaving the construction site.*

MOLD REMOVAL GUIDELINES

A. MOLD REMOVAL PROCEDURES

1. If mold is suspected in a building, Safety and/or Infection Control will survey for visible mold growth. If visible mold growth is found, Facilities Management Engineering will survey the area to find the source of the moisture, such as a leak of condensation that is causing the mold growth. When visible mold growth is found, it will be removed in accordance with these procedures. Some leaks, especially roof leaks, may take longer to fix than others and extra precautions will be taken in the interim to minimize mold growth.

2. In some cases, mold may grow behind walls, or in other contained, non-visible spaces. If hidden mold growth is suspected in an area after flood or other occurrence of water in the area, a moisture meter will be used to try to locate the hidden mold. If hidden mold is found, it will be removed in accordance with these procedures. If necessary, a section of the wall will be cut out to allow drying.

3. Removal of visible mold will be done according to procedures based on the EPA guidance document *"Mold Remediation in Schools and Commercial Buildings"* printed in March of 2001 and follow the Joint Commission Environment of Care Standards. An Infection Control Risk Assessment will be completed when mold remediation activities qualify as Type C or Type D, and for Type B activities in the highest risk areas, as designated on the Risk Assessment, Appendix B. Staff performing environmental interventions must have training developed by Infection Control and Safety. If there are water damaged materials adjacent to moldy materials, Safety will be consulted to determine if water damaged materials should be removed as well. Some water-damaged materials may harbor mold growth that is not yet visible.

4 In most cases, such as replacement of a few ceiling tiles or removal of mold on limited hard surfaces, containment and use of PPE will not be required for mold removal.

5. In rare cases where there is excessive visible mold in a room or space, it must be cleaned or removed in a contained area. Examples of occasions where containment would be required include work that is expected to generate a moderate to high level of dust, such as removal of building components or demolition of mold contaminated materials.

    a. When these conditions occur, the moldy area will be sealed off from the remainder of the room or buildings with one or two layers of heavy plastic sheeting. Any ventilation ducts in the space will be sealed off with plastic. The area will be kept under slight

negative pressure either with a fan that exhaust directly to the outside or a fan that HEPA filters air and exhausts it back into the building interior. When containment is required, no mold remediation work will be done until containment is set up.

b. Employees performing mold remediation in containment areas must wear personal protective equipment (PPE). The following is required as a minimum: N-95 or half-face respirator with HEPA filter (with current fit test), disposable coveralls, and goggles to protect the eyes from dust. A Powered Air Purifier Respirator (PARR) with HEPA filter can be substituted for the minimum respirator required, and a full-face PAPR or respirator will eliminate the need for dust goggles. If construction equipment will be used that requires additional eye protection, that eye protection must be used as well. Disposable PPE, including the coveralls, must be removed upon leaving the containment area, to prevent potentially moldy dust from being carried through the building. Non-disposable PPE should be rinsed or wiped off before it is removed from the containment area.

c. After all moldy materials are cleaned or removed, dust should be cleaned from all surfaces in the containment area before the containment is removed. Reconstruction of building walls and other fixtures may be completed after the containment is removed. If reconstruction work will create dust, it is strongly recommended that the reconstruction work be done before the containment is cleaned and removed to minimize dust transmission associated with the reconstruction work.

6. If mold growth is found on any non-porous building surfaces or furnishings, such as metal surfaces, concrete, or vinyl floor tile, these surfaces can be thoroughly cleaned and treated with a standard hospital disinfectant solution that is antifungal. Bleach will not be used because of variations in concentration, the absence of a surfactant, and the potential for corrosion/staining. Consult the Industrial Hygienist for proper PPE to be worn while doing the work.

7. If mold growth is found on any porous building materials or furnishings, such as ceiling tiles, wallboard, carpet, fabrics, books, or papers, the moldy portion of those materials or furnishings must be removed and disposed of. Small items or small pieces will be double-bagged using 6-mil polyethylene sheeting and then discarded as ordinary construction waste. Large items should be covered with polyethylene sheeting and sealed with duct tape before they are removed from the area. Precautions must be taken to contain or remove all dust before waste is removed from the containment area into the remainder of the building. Consult the Industrial Hygienist for proper PPE to be worn while doing the work.

8. Ceiling tiles that are known to be or suspected of being moldy should be removed in the following manner unless they are removed inside a containment area: Lift an adjacent ceiling tile that is not suspected of being moldy. Use that opening to observe the tops of ceiling tiles to determine the presence of mold visible from the top. Identify all moldy tiles in the area. For each moldy tile, spray both top and bottom surfaces with a soap or detergent solution. Use enough solution to cover the entire tile surface, but not enough to drip. Once both the top and bottom are dampened, carefully lift the tile, minimizing any impacts that could jar loose any debris. Immediately place the entire tile into a plastic bag for disposal. Seal the bag containing the removed tiles before leaving the area. If the leak that wetted the tiles has been eliminated, replace the tiles with fresh ones. If not, replace the tile with a drip basin that will collect any further drips and that can be emptied, keeping all building materials dry.

B. <u>TRAINING</u>

The Industrial Hygienist will be responsible for training all FMS employees involved with mold remediation activities. The training will be conducted annually and will consist of:

1. *Awareness of mold in the workplace*
2. *The use of PPE when necessary*
3. *Removal of mold under EPA Guidelines, Mold Remediation in Schools and Commercial Buildings*
4. *Proper disposal of moldy materials and disposable PPE*

Preconstruction Risk Assessment

I. PURPOSE

The purpose of this attachment is to establish policy and procedures to ensure that safety and the environment of care in all patient care buildings is not compromised during any project renovations or new construction. When planning demolition, construction, or renovation work, the Engineering Project Section, and the Safety Officer will conduct a pro-active risk assessment using risk criteria to identify hazards that could potentially compromise patient care in occupied areas of the buildings. The risk criteria shall address the impact that demolition, renovation, or new construction activities will have on air quality requirements, utility requirements, noise, vibration, and emergency procedures.

II. POLICY

The VA Pittsburgh will ensure that safety and environment of care will not be adversely affected due to project renovation or new construction. The VA Pittsburgh Medical Center supports a multi-disciplinary, systematic proactive risk assessment program during all phases of construction/renovation to identify hazards to patient care, to take appropriate actions to reduce risk, and to minimize the impact of these activities. All renovation or construction projects will be reviewed with Contractor Officer I Representative (COR) and the Safety Office during the planning phases.

A. COR and the Safety Office will participate in meetings and area walk-through inspections as necessary. Walk through inspections by the Safety Department may be conducted without prior notice.

B. All contractors, including subcontractors, Project Coordinators, and Facilities Management employees must follow the preconstruction risk assessment control procedures as described in this guideline.

C. General Contractor is responsible for identifying all potential construction risks as outlined in Preconstruction Risk Assessment (Attachment E, page 5 of 8) and to submit a schedule to COR for review and approval prior to commencement of construction.

III. RESPONSIBILITIES

The Medical Center Director will assure that all project coordinators, engineers, COR's, Supervisor of Projects, and Safety conduct a Preconstruction Risk Assessment. This assessment will identify all potential construction

A. Hazards of projects involving construction and/or renovation of clinical and non-clinical areas in the medical center.

B. Project Engineering and Safety are responsible for:

a. Monitor and respond to safety and hazards relating to issues during construction and renovation projects.

b. Upon request, conduct assessments of the hazardous conditions.

c. COR will submit the approved construction schedule (reference Part II. C. of this attachment). This schedule will provide details of construction progress identifying hazards of construction and means for controlling these risks as outlined in the Pre-Construction Risk Assessment (Attachment E, page 5 of 8), Lockout-Tag out System Procedures FMS-010, and Utility Outages Policy FMS-14.

d. The Project Engineer (COR) will issue the Preconstruction Risk Assessment Permit upon acceptance of schedule submitted by the contractor.

IV. PROCEDURES

A. Planning Phase

a. Projects Section and the Safety Office will participate in the project pre-construction meeting.

b. Projects Section, Safety Officer, and General Contractor will be involved in the planning phases for all renovation and new construction projects and have input specific to the following major components (design):

i. Design to control and minimize construction hazards control practices as outlined below:

1. Noise.
2. Vibrations
3. Air Quality
4. Traffic Control.
5. Emergency Procedures (Proactive/Reactive Measures)
6. Utility Requirements (Shut Downs, Tie-in's)

These hazards could potentially compromise patient care during project construction and renovation. This group will take

appropriate action to reduce the risk and impact on patient care. Assessment, action, and schedule will be documented and maintained with the project files located in the office of the Facilities Management, Projects Section. A Preconstruction Risk Assessment shall be used. The completed permit will be posted at the construction entrance.

c. The contractor will complete the Preconstruction Risk Assessment (Attachment A) and corresponding schedule. Both these documents will be submitted to the COR with the construction schedule per contract documents and General Requirements 01 00 00. Construction will not commence until PCRA permit and construction schedule area approved by COR. The PCRA Permit will then be signed by the Contractor, COR, and/or the VA MIT/M&R, and the Safety Officer.

d. Contractor to comply with VA Pittsburgh Healthcare System Standard Operating Procedure, Lockout-Tag out System Procedures, FMS-010., VA Pittsburgh Healthcare System Standard Operating Procedure, Utility Outages, FMS-014, OSHA Regulation, and all VA Security Policies.

e. Installations/minor improvement projects, likewise, require a completed Preconstruction Risk Assessment. Persons requesting the installation/ minor improvement project (i.e. IT, Interior Design, service line business manager) must complete the assessment and permit allowing sufficient time prior to the start of the project, with the assistance of the Safety Officer.

B. Operational Phase

a. The Safety Officer or designee will address specific construction control concerns to the Project Coordinator and/or COR. These issues will be resolved with the contractor for incorporation into the construction schedule. This schedule is a required submission as per contract requirements.

b. The Safety Officer, Project Coordinator and/or COR, and other appropriate construction project team members reserve the right to modify the PCRA and add requirements to a project on an individual basis to ensure patient and staff safety.

Education/Training. Contractors and their subcontractors will be educated on required construction hazard control prevention and other safety measures during construction and renovation by using various training mechanisms (i.e., Medical Center Requirements,01 01 10,

c. General Requirements 01 00 00, OSHA Regulations, National Electrical Codes, NFPA 70, and Life Safety Code).

C. Compliance Monitoring

a. The Project Coordinator and/ or COR will conduct weekly safety inspections. Safety and COR will round construction site weekly as necessary. Safety will notify COR and/or Project Coordinator of any areas of noncompliance. Project Coordinator and/or COR will document activities and require general contractor to immediately rectify any noncompliance findings. Failure of general contractor to immediately resolve noncompliance will result in construction shut down. Once noncompliance is corrected, construction may commence. The contractor is responsible for any lost time due to noncompliance.

b. Projects not in compliance with PCRA permit and Medical Center Policies will be shut down until all issues are resolved. Deficiencies will be reported to the Contracting Officer for immediate correction and mediation.

c. Emergencies and Remediation

i. Potential types of emergencies and the effect on patients and staff should be identified during the preconstruction meetings. Remedial action for each emergency should be established so that a rapid response can occur.

ii. The IH/Safety Officer will function as consultants and provide the necessary expertise and direction to others to help contain and correct emergencies (i.e., water contamination, contamination of the ventilation system, unplanned utility failures), minimizing infection control and safety risks to patients and employees.

V. REFERENCES

A. The Joint Commission Environment of Care Standards
B. VA Pittsburgh Healthcare System Standard Operating Procedure, Lockout-Tag out System Procedures, FMS-010, September 3, 2009
C. VA Pittsburgh Healthcare System Standard Operating Procedure, Utility Outages, FMS-014, February 16, 2011
D. AIA, Guidelines for Design and Construction of Hospital and Health Care Facilities, 2001.
OSHA Occupational Safety and Health standards 29 CFR 1910 and 1960
www.osha.gov/SLTC/indoorairquality/index.html

Safety Construction Permit

Location of Construction:	**Project Start Date:**
Project Coordinator:	**Estimated Duration:**
Contractor Performing Work:	**Permit Expiration Date:**
visor:	**Telephone:**

Description of project:

Construction Activities

The following projects do not require completion of the Pre-construction risk assessment form:

1. Paint and wallpaper in business offices and non-patient areas.
2. Paint in patient room if closed for painting and less than 3 sq.ft. of wall needs patched. Filter for room unit changed after painting.
3. Installation of soap dispenser/needle box/paper towel holder in patient room
4. Repair of window blind.
5. Ceiling tile replacement for areas less than 50% of the total square footage of the room, if not in business offices and non-patient areas.
6. Ceiling tile replacement for area less than 5 2 X 2 tiles in a patient area if patient is out of the immediate area and clean up can be accomplished before patient returns.
7. Minimum repair of nurse call system/TV/Bed/Telephone.
8. Check or replace electric outlet.
9. Replace light bulb.
10. Unstop sink/commode with no water on floor.
11. Unstop commode when water on floor requires maintenance to have Housekeeping clean area immediately.
12. Repair medical gas outlet. (Front Body)
13. Air balance readings.
14. Check air-conditioning.

Yes	No	
		Will there be noise generated that will impact a department adjacent to, above, or below the construction area?
		a. If so, these departments must be notified.
		b. How are you going to reduce the noise to an acceptable level?

Yes	No	
		Will there be vibration generated that will impact a department adjacent to, above, or below the construction area?
		a. If so, these departments must be notified each time this type of work will be performed.
		b. How are you going to reduce the vibration to an acceptable level?

Yes	No	
		Are Emergency Procedures in place and posted on each job for accidental events that could greatly impact Patient Care or Life Safety to the facility? Included in these procedures are such things as: • Emergency telephone numbers of key departments. • A plan that describes where main valves, switches, and controls are for the area in case of an emergency. • A plan for unexpected outages.

Environment		
Yes	**No**	**Are any of the following environmental hazards present?**
		Will hazardous chemicals be used on this project? How will fumes and odors be controlled? ***MSDS Sheets are required.***
		Is asbestos abatement required on this job? ***If so, notify Safety and FES at the activation.***
		Will there be hot work done on this project? If there are, then a hot work permit must be posted on the job site. All hot work must have a fire watch assigned to each area while the hot work is being performed.
		Will there be a Confined Space Entry required on this project? If so, the Medical Center's confined space entry program must be followed.

Utility Failures		
Yes	**No**	**Will any of the following systems be out of service at any time during the project?**
		• Fire alarm ***(If out for more than 4 hours, Interim Life Safety Measures must be implemented.)***

		• Sprinkler ***(If out for more than 4 hours, Interim Life Safety Measures must be implemented.)***
		• Electrical
		• Domestic water
		• Oxygen
		• Sewage

		• HVAC

Yes	No	
		Will there be any work that will require activation of the Interim Life Safety Measures during this project? Some things that trigger ILSM's to be implemented are but not limited to: • Any construction that impacts an EXIT or stairs, • Any construction that impacts major breaches in a fire or smoke wall, (penetration permit required) • Taking the main fire protection system out of service (sprinkler) • Taking the main fire alarm system out of service • Taking the "area" fire or fire alarm systems out of service for more than 4 hours within a 24 hour period
		Implementation of the ILSM requires a fire watch and the ILSM forms to be completed (forms are to be obtained from the Safety Department.
Additional Safety Concerns		
Yes	**No**	
		Will construction affect exit routes from occupied areas adjacent to construction site?
		Will project affect traffic patterns in area? ***If yes, explain plan.***
		The following must be completed prior to any construction activities.

		• Separation wall must be constructed prior to project beginning. • Fire protection systems must remain intact. • Provide extra fire extinguishers in work areas. • Maintain exit lights in work area. • Maintain negative air in construction area (24/7) through duration of project. • There cannot be any return air from within the construction area to the rest of the building. • Redirect exiting not to go through construction area. • Put signs on doors into construction area "Construction Area – Do Not Enter". • Maintain daily logs and keep a current Hot Work Permit. • Place tacky mats at doors exiting construction area. • All debris removal must be by covered cart. • Maintain clean and orderly work area. • How will this project affect the departments above, below and adjacent to this project?

Permit Requested By	**Safety Approval**	**COR/Project Coordinator**
Date:	**Date:**	**Date:**

DEPARTMENT OF VETERANS AFFAIRS Memorandum EC-061
VA Pittsburgh Healthcare System
Pittsburgh, PA 15240 March 3, 2011

FIRE WALL AND SMOKE BARRIER PENETRATIONS

I. PURPOSE

To establish procedures regarding penetrations in ceilings, floors, pipe chases, fire walls, and smoke barriers for the purpose of maintaining the integrity of these structures as required by NFPA 101, Chapter 8.

II. POLICY

All penetrations made in floors, ceilings, fire barriers and smoke partitions for the purpose of installing/removing pipe, conduit, cable, or ductwork, other modifications including incidental damage, or the removal of such items, will be repaired/sealed upon completion of the work and documented as repaired. This policy applies to all vertical and horizontal penetrations and to all VAPHS staff and contractors.

III. DEFINITIONS

A. Penetrations: Any hole, opening or fault created in a fire barrier or smoke partition that compromises the integrity or fire rating of the penetrated structure.

B. Fire Stopping Material: Material used to replace or repair any penetrations. Material must meet specifications to ensure the original integrity and rating of the penetrated surface is restored.

C. Fire Barriers: Floor, ceiling assemblies, and walls, including supporting construction that meets the conditions of acceptance of NFPA 251. Fire barriers are designed to form fire compartments and are constructed to be continuous from outside wall to outside wall, from one fire barrier to another, or a combination thereof, including continuity through concealed spaces.

IV. RESPONSIBILITIES

A. All Service Line Vice Presidents must be aware of the requirements of this policy with respect to equipment installations that are coordinated within their assigned building space.

B. Contracting Officer's Technical Representative (COTR's), Facilities and Engineering Service, Office of Information and Technology (OI&T) and other responsible person coordinating or performing work above the finished ceiling are responsible for implementation of the policy requirements. Requirements for Interim Life Safety Measures (ILSM) and associated documentation may supercede for some new construction and renovation projects.

C. Supervisory Project Engineer and/or Engineering Program Manager will issue permits for their respective projects/work and inspect all work under their jurisdiction performed above the finished ceiling in all buildings. (Attachment A).

D. Safety staff will provide training and technical consultation as needed for the successful implementation of this program.

V. PROCEDURES

A. A Fire/Smoke Barrier Penetration permit is obtained from the Supervisor Project Engineer and/or Engineering Program Manager. The permit shall be available for inspection at the designated site(s).

B. Prior to installation of equipment, cables, power connect, conduit, etc., all said work, including Office of Information & Technology project, will be approved by the Safety Section, Project Engineers, or delegates. This will include a review of the location and scope of work with the individual(s) performing the project.

C. The penetration, after installation or modification of the barrier, must be repaired (sealed) according to accepted practice and utilizing approved materials.

D. Upon completion of any penetration repair, a visual inspection for approval must be requested from the Project Engineer (if related to an Engineering project) or Safety.

E. The completed Permit will be signed by the user/responsible person(s) and Safety staff or the Project Engineer. Records shall be maintained in the Safety Section office.

VI. REFERENCES

NFPA 101, Chapter 8I

VII. RESCISSION

None

VIII. CONCURRENCES

001, 002, 11, 11D, 00S, 00B, All Service Line VP's, AFGE 2028 and 3344

IX. EXPIRATION

This memorandum automatically expires on March 3, 2014.

//Signed//
TERRY GERIGK WOLF, FACHE
Director

Attachments

FIRE / SMOKE WALL PENETRATION PERMIT

Contractor/Dept/Service: _____

COTR/Responsible Person: _____

Location of Penetrations: _____

Work Narrative (Purpose): _____

Before issuing a Fire/Smoke Wall Penetration Permit, the Facilities Maintenance/Safety and/or Projects Section shall review the following checklist with the responsible person.

	Yes	No	N/A
Did the responsible person obtain prints from Facilities Maintenance or Projects Section detailing hourly rated walls and identified the scope of the fire stop work?			
Is manufacturer's product (fire sealant) application guide containing UL listed fire stop systems available and approved?			
Has the responsible person prepared an itemized schedule of fire/ smoke walls to be penetrated?			

Materials utilized in repair:

Firestopping _____

Wall Board _____

Other _____

Approving Official: _____**Date:** _____

After penetrations are sealed, Facilities Maintenance, Projects or Safety and responsible person shall inspect the areas to ensure compliance with the required standards.

Inspected by: _____

Signature (COTR): _____ Inspection Date: _____

Signature: (Safety)_____

Copy sent to Safety ☐

PRECONSTRUCTION RISK ASSESSMENT FOR CONSTRUCTION COMPLIANCE

I. PURPOSE

The purpose of this memorandum is to establish policy and procedures to ensure that safety and the environment of care in all patient care buildings is not compromised during any project renovations or new construction. When planning demolition, construction, or renovation work, the Engineering Project Section, and the Safety Officer will conduct a pro-active risk assessment using risk criteria to identify hazards that could potentially compromise patient care in occupied areas of the buildings. The risk criteria shall address the impact that demolition, renovation, or new construction activities will have on air quality requirements, utility requirements, noise, vibration, and emergency procedures.

II. POLICY

The VA Pittsburgh will ensure that safety and environment of care will not be adversely affected due to project renovation or new construction. The VA Pittsburgh Medical Center supports a multi-disciplinary, systematic proactive risk assessment program during all phases of construction/renovation to identify hazards to patient care, to take appropriate actions to reduce risk, and to minimize the impact of these activities. All renovation or construction projects will be reviewed with Contractor Officer Technical Representative (COTR) and the Safety Office during the planning phases.

A. COTR and the Safety Office will participate in meetings and area walk-through inspections as necessary. Walk through inspections by the Safety Department may be conducted without prior notice.

B. All contractors, including subcontractors, Project Coordinators, and Facilities Management employees must follow the preconstruction risk assessment control procedures as described in this guideline.

C. General Contractor is responsible for identifying all potential construction risks as outlined in Preconstruction Risk Assessment (Attachment A) and to submit a schedule to COTR for review and approval prior to commencement of construction.

III. RESPONSIBILITIES

A. The Medical Center Director will assure that all project coordinators, engineers, COTR's, Supervisor of Projects, and Safety conduct a Preconstruction Risk Assessment. This assessment will identify all potential construction hazards of projects involving construction and/or renovation of clinical and non-clinical areas in the medical center.

B. Project Engineering and Safety are responsible for:

a. Monitor and respond to safety and hazards relating to issues during construction and renovation projects.

b. Upon request, conduct assessments of the hazardous conditions.

c. COTR will submit the approved construction schedule (reference Part II. C. of this policy). This schedule will provide details of construction progress identifying hazards of construction and means for controlling these risks as outlined (Attachment A), Lockout-Tag out System Procedures FMS-010 (Attachment B), and Utility Outages Policy FMS-14 (Attachment C).

d. The Project Engineer (COTR) will issue the Preconstruction Risk Assessment Permit upon acceptance of schedule submitted by the contractor.

IV. PROCEDURES

A. Planning Phase

a. Projects Section and the Safety Office will participate in the project pre-construction meeting.

b. Projects Section, Safety Officer, and General Contractor will be involved in the planning phases for all renovation and new construction projects and have input specific to the following major components (design):

i. Design to control and minimize construction hazards control practices as outlined below:

1. Noise.
2. Vibrations
3. Air Quality
4. Traffic Control.
5. Emergency Procedures (Proactive/Reactive Measures)
6. Utility Requirements (Shut Downs, Tie-in's)

ii. These hazards could potentially compromise patient care during project construction and renovation. This group will take appropriate action to reduce the risk and impact on patient care. Assessment, action, and schedule will be documented and maintained with the project files located in the office of the Facilities Management, Projects Section. A Preconstruction Risk Assessment (Attachment A) shall be used. Permit will be posted at the construction entrance.

c. The contractor will complete the Preconstruction Risk Assessment (Attachment A) and corresponding schedule. Both these documents will be submitted to the COTR with the construction schedule per contract documents and General Requirements 01 00 00. Construction will not commence until PCRA permit and construction schedule area approved by COTR. The PCRA Permit will then be signed by the Contractor, COTR, and/or the VA MIT/M&R, and the Safety Officer.

d. Contractor to comply with VA Pittsburgh Healthcare System Standard Operating Procedure, Lockout-Tag out System Procedures, FMS-010 (Attachment B), VA Pittsburgh Healthcare System Standard Operating Procedure, Utility Outages, FMS-014 (Attachment C), OSHA Regulation, and all VA Security Policies.

e. Installations/minor improvement projects, likewise, require a completed Preconstruction Risk Assessment (Attachment A). Persons requesting the installation/ minor improvement project (i.e. IT, Interior Design, service line business manager) must complete the assessment and permit allowing sufficient time prior to the start of the project, with the assistance of the Safety Officer.

B. Operational Phase

a. The Safety Officer or designee will address specific construction control concerns to the Project Coordinator and/or COTR. These issues will be resolved with the contractor for incorporation into the construction schedule. This schedule is a required submission as per contract requirements.

b. The Safety Officer, Project Coordinator and/or COTR, and other appropriate construction project team members reserve the right to modify the PCRA and add requirements to a project on an individual basis to ensure patient and staff safety.

c. Education/Training. Contractors and their subcontractors will be educated on required construction hazard control prevention and other safety measures during construction and renovation by using various training mechanisms (i.e., Medical Center Requirements,01 01 10,

General Requirements 01 00 00, OSHA Regulations, National Electrical Codes, NFPA 70, and Life Safety Code).

C. Compliance Monitoring

a. The Project Coordinator and/ or COTR will conduct weekly safety inspections. Safety and COTR will round construction site weekly as necessary. Safety will notify COTR and/or Project Coordinator of any areas of noncompliance. Project Coordinator and/or COTR will document activities and require general contractor to immediately rectify any noncompliance findings. Failure of general contractor to immediately resolve noncompliance will result in construction shut down. Once noncompliance is corrected, construction may commence. The contractor is responsible for any lost time due to noncompliance.

b. Projects not in compliance with PCRA permit and Medical Center Policies will be shut down until all issues are resolved. Deficiencies will be reported to the Contracting Officer for immediate correction and mediation.

c. Emergencies and Remediation

i. Potential types of emergencies and the effect on patients and staff should be identified during the preconstruction meetings. Remedial action for each emergency should be established so that a rapid response can occur.

ii. The IH/Safety Officer will function as consultants and provide the necessary expertise and direction to others to help contain and correct emergencies (i.e., water contamination, contamination of the ventilation system, unplanned utility failures), minimizing infection control and safety risks to patients and employees.

V. REFERENCES

A. The Joint Commission Environment of Care Standards
B. VA Pittsburgh Healthcare System Standard Operating Procedure, Lockout-Tag out System Procedures, FMS-010, September 3, 2009
C. VA Pittsburgh Healthcare System Standard Operating Procedure, Utility Outages, FMS-014, February 16, 2011
D. VA Pittsburgh Healthcare System, Safety and Health During Construction Activities, EC-051, June 10, 2009
E. Infection Prevention and Control and Safety/Health Guidelines for Construction and Renovation, EC-043, October 15, 2009
F. AIA, Guidelines for Design and Construction of Hospital and Health Care Facilities, 2001.
G. OSHA Occupational Safety and Health standards 29 CFR 1910 and 1960 www.osha.gov/SLTC/indoorairquality/index.html

VI. CONCURRENCES

138P, 138S

VIII. EXPIRATION
This memorandum will automatically expire on March 14, 2014.

//Signed/
TODD HOUCK
VP, Facilities Management

Distribution: Safety, Engineering, Projects

Attachments:
A. Preconstruction Risk Assessment Worksheet and Permit
B. VA Pittsburgh Healthcare System Standard Operating Procedure, Lockout-Tag out System Procedures, FMS-010, September 3, 2009
C. VA Pittsburgh Healthcare System Standard Operating Procedure, Utility Outages, FMS-014, February 16, 2011

Pre-Construction Risk Assessment

Safety Construction Permit

Location of Construction:	**Project Start Date:**
Project Coordinator:	**Estimated Duration:**
Contractor Performing Work:	**Permit Expiration Date:**
Supervisor:	**Telephone:**

Description of project:

Construction Activities

The following projects do not require completion of the Pre-construction risk assessment form:

1. Paint and wallpaper in business offices and non-patient areas.
2. Paint in patient room if closed for painting and less than 3 sq.ft. of wall needs patched. Filter for room unit changed after painting.
3. Installation of soap dispenser/needle box/paper towel holder in patient room
4. Repair of window blind.
5. Ceiling tile replacement for areas less than 50% of the total square footage of the room, if not in business offices and non-patient areas.
6. Ceiling tile replacement for area less than 5 2 X 2 tiles in a patient area if patient is out of the immediate area and clean up can be accomplished before patient returns.
7. Minimum repair of nurse call system/TV/Bed/Telephone.
8. Check or replace electric outlet.
9. Replace light bulb.
10. Unstop sink/commode with no water on floor.
11. Unstop commode when water on floor requires maintenance to have Housekeeping clean area immediately.
12. Repair medical gas outlet. (Front Body)
13. Air balance readings.
14. Check air-conditioning.

Yes	No	
		Will there be noise generated that will impact a department adjacent to, above, or below the construction area?
		a. If so, these departments must be notified.
		b. How are you going to reduce the noise to an acceptable level?

Yes	No	
		Will there be vibration generated that will impact a department adjacent to, above, or below the construction area?
		a. If so, these departments must be notified each time this type of work will be performed.
		b. How are you going to reduce the vibration to an acceptable level?

Yes	No	
		Are Emergency Procedures in place and posted on each job for accidental events that could greatly impact Patient Care or Life Safety to the facility? Included in these procedures are such things as: • Emergency telephone numbers of key departments. • A plan that describes where main valves, switches, and controls are for the area in case of an emergency. • A plan for unexpected outages.
		Environment
Yes	**No**	**Are any of the following environmental hazards present?**
		Will hazardous chemicals be used on this project? How will fumes and odors be controlled? ***MSDS Sheets are required.***
		Is asbestos abatement required on this job? ***If so, notify Safety and FES at the activation.***
		Will there be hot work done on this project? If there are, then a hot work permit must be posted on the job site. All hot work must have a fire watch assigned to each area while the hot work is being performed.
		Will there be a Confined Space Entry required on this project? If so, the Medical Center's confined space entry program must be followed.

		Utility Failures
Yes	**No**	**Will any of the following systems be out of service at any time during the project?**
		• Fire alarm ***(If out for more than 4 hours, Interim Life Safety Measures must be implemented.)***
		• Sprinkler ***(If out for more than 4 hours, Interim Life Safety Measures must be implemented.)***
		• Electrical
		• Domestic water
		• Oxygen

		• Sewage
		• HVAC
Yes	**No**	
		Will there be any work that will require activation of the Interim Life Safety Measures during this project? Some things that trigger ILSM's to be implemented are but not limited to: • Any construction that impacts an EXIT or stairs, • Any construction that impacts major breaches in a fire or smoke wall, (penetration permit required) • Taking the main fire protection system out of service (sprinkler) • Taking the main fire alarm system out of service • Taking the "area" fire or fire alarm systems out of service for more than 4 hours within a 24 hour period
		Implementation of the ILSM requires a fire watch and the ILSM forms to be completed (forms are to be obtained from the Safety Department.
Additional Safety Concerns		
Yes	**No**	
		Will construction affect exit routes from occupied areas adjacent to construction site?

		Will project affect traffic patterns in area? ***If yes, explain plan.***
		The following must be completed prior to any construction activities.
		• Separation wall must be constructed prior to project beginning. • Fire protection systems must remain intact. • Provide extra fire extinguishers in work areas. • Maintain exit lights in work area. • Maintain negative air in construction area (24/7) through duration of project. • There cannot be any return air from within the construction area to the rest of the building. • Redirect exiting not to go through construction area. • Put signs on doors into construction area "Construction Area – Do Not Enter". • Maintain daily logs and keep a current Hot Work Permit. • Place tacky mats at doors exiting construction area. • All debris removal must be by covered cart. • Maintain clean and orderly work area. • How will this project affect the departments above, below and adjacent to this project?

Permit Requested By	**Safety Approval**	**COTR/Project Coordinator**
Date:	**Date:**	**Date:**

Department of Veterans Affairs **VHA DIRECTIVE 2011-036**
Veterans Health Administration
Washington, DC 20420 **September 22, 2011**

SAFETY AND HEALTH DURING CONSTRUCTION

1. PURPOSE: This Veterans Health Administration (VHA) Directive establishes policy for maintaining a safe and healthy worksite for staff, volunteers, visitors, contractors, and the general public during construction and renovation-related activities. This policy applies to all construction activities as defined by Occupational Safety and Health Administration (OSHA) that are performed at VHA owned or leased facilities regardless of whether performed by VHA or contractor staff.

2. BACKGROUND

a. OSHA Title 29 Code of Federal Regulations (CFR) Part 1926, The Joint Commission (TJC) and National Fire Protection Association (NFPA) standards identify requirements for safe construction practices. Environmental Protection Agency (EPA) regulations address safety requirements related to specific environmental issues (e.g., asbestos, lead, etc.). The Federal Acquisition Regulation (FAR) and Veterans Affairs Acquisition Regulation (VAAR) address contractor safety and Department of Veterans Affairs (VA) oversight requirements.

b. The implementation of a proactive and comprehensive construction safety program reduces the potential for injury and illness from unsafe and unhealthy construction activities. Construction safety programs reduce the potential for VHA liability that could result from construction-related accidents, injuries or exposures.

c. **Definitions**

(1) **Competent Person (CP).** OSHA defines a CP as one who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them (see 29 CFR 1926.32(f)).

(2) **Construction.** OSHA defines construction as alteration or repair, including painting and decorating of a large scale or high-complexity. For further clarification of the definition of construction please refer to OSHA's letters of interpretation (see subpar. 5s).

(3) **Construction Lead Person**. The construction lead person is typically the contractor's foreperson or superintendent, or the VHA foreperson or engineering supervisor. However, it could be any other individual assigned to lead and direct a work crew operation. This person acts as the OSHA CP responsible for monitoring the construction site for hazards and implementing corrective actions.

(4) **Construction Safety Officer (CSO).** The CSO identifies worksite risk and coordinates risk reduction activities through the Contracting Officer (CO) or the Contracting Officers

Technical Representative (COTR), collects deficiency information, and disseminates summaries of action and results (TJC standards, construction risks in physical environment). This individual satisfies the VAAR 852.236-87 (see subpar. 5p) requirement to have a Safety Officer to monitor and enforce Contractor compliance with FAR 52.236-13 (see subpar. 4r).

(5) **High-Severity Serious-Construction (HSCS) Accidents.** HSCS accidents include fatalities and permanently disabling injuries or illnesses. This includes amputations, crushing with loss of use of body part, third to fifth degree burns or scalds, loss of sight, and respiratory illnesses. HSCS accidents include near misses that could result in fatalities or permanently disabling injuries or illnesses.

(6) **Interim Life Safety Measures (ILSM).** ILSM is a series of eleven administrative actions to temporarily mitigate National Fire Protection Association 101 2000 Life Safety Code deficiencies or construction activities (TJC standards) (see Standards Sec. EC 5.5).

(7) **Maintenance.** The term "maintenance" refers to applied trades work on a structure, fixture, foundation or other building systems to ensure a safe and functional condition.

3. POLICY: It is VHA policy that construction and renovation activities on VHA-owned property and VHA-leased property be conducted in such a way as to protect the health and safety of VHA and contractor staff, patients, and the public.

4. ACTION

a. **Under Secretary for Health**. The Under Secretary for Health ensures that a national policy covering construction safety at VHA facilities is issued.

b. **Deputy Under Secretary for Health for Operations and Management.** The Deputy Under Secretary for Health for Operations and Management is responsible for issuing program guidance and policy related to construction safety at VHA facilities.

c. **Director, Office of Construction and Facilities Management (00CFM).** The Director, Office of Construction and Facilities Management (00CFM), is responsible for:

(1) Developing construction guides, specifications and contract documents that specifically address safety requirements for construction projects. Specifications and project designs must reflect OSHA, NFPA, EPA, VA, and TJC requirements, and other recognized standards of safety that apply to the construction industry.

(2) Providing design documents for construction projects to appropriate VA, Veterans Integrated Service Network (VISN) and VA medical center staff for review.

(3) Ensuring Resident Engineers (RE) complete the OSHA 30-hour Construction Safety training course and a minimum 10 hours of construction safety refresher training every 2 years. The construction safety training must be documented in the RE's training record.

(4) Ensuring REs comply with the established Resident Engineer Handbook (see subpar.5q), VAAR 852.236 (see subpar. 5p), and FAR 52.236.13.

(5) Ensuring that on-site general and sub-contractor's construction workers have completed the OSHA 10 hour Construction Safety training, 30 hour Construction Safety course, and other relevant competency training.

d. **Director, Safety, Health and Environmental Compliance.** The Director, Occupational Safety and Health, Environmental, and Emergency Management is responsible for:

(1) Providing professional construction safety guidance in the recognition, evaluation, and control of construction hazards that comply with OSHA regulations, TJC accreditation requirements, and VA policy.

(2) Developing and implementing construction safety goals and initiatives for the protection of staff, patients, visitors, contractors, and the public while on VHA-owned and VHA-leased properties.

(3) Monitoring and evaluating VHA's construction safety program to ensure the reduction of construction work-related injuries and illnesses.

(4) Evaluating HSCS construction accidents to determine causal factors, developing control measures, and identifying lessons learned.

(5) Providing construction safety expertise to the Employee Education System (EES) in the development of Construction Safety training materials for VHA staff.

e. **Director, VHA Office of Healthcare Engineering**. The Director, Office of Healthcare Engineering is responsible for:

(1) Providing engineering support to VHA and VA Departments for the mitigation of construction hazards and risks.

(2) Communicating hazard alerts to health care engineers at VA-owned and VA-leased facilities.

(3) Conducting, at VHA senior management's request, incident-related site investigations and report analysis.

f. **Director, Infectious Disease Program.** The Director, Infectious Disease Program is responsible for:

(1) Advising and providing recommendations on exposure mitigation and prevention of facility-associated infections for patients, staff, and visitors.

(2) Providing information and advice to VHA on infectious diseases associated with construction.

(3) Advising or providing recommendations on protective practices to be employed during construction that reduce the risk of infection.

g. **Director, Occupational Health, Strategic Health Care Group, Office of Public Health.** The Director, Occupational Health, Strategic Healthcare Group is responsible for providing consulting services to VHA, 00CFM, and the Office of Asset and Enterprise Management (OAEM) staff on occupational health issues related to construction activities.

h. **Chief Officer, VHA Procurement and Logistics Office.** The Chief Officer, VHA Procurement and Logistics Office, is responsible for ensuring that contracts and related documents for construction and enhanced-use leased projects, include language that requires the work performed adheres to the requirements of this Directive.

i. **Director, Office of Enterprise Operations and Field Development within The Office of Information and Technology (OI&T).** The Director, Office of Enterprise Operations and Field Development, OI&T, is responsible for ensuring that contracts and related documents for construction and enhanced-use leased projects include language that mandates adherence to the requirements of this Directive.

j. **Veterans Integrated Service Network (VISN) Director.** Each VISN Director is responsible for ensuring that:

(1) VHA policies for construction safety programs at VHA facilities are implemented.

(2) The effectiveness of facility construction safety management program is monitored as a part of the Annual Workplace Evaluations (AWE) using the Safety Automated Facility Evaluation (SAFE) program.

(3) All VISN Safety and Health Program Managers and staff that have responsibilities related to construction complete a 30-hour OSHA Construction Safety training and, as a refresher, subsequently complete at least 10 hours of construction safety-related training every 2 years. The construction safety training must be documented in their training record.

k. **VHA Facility Director.** The VHA Facility Director is responsible for:

(1) Establishing and monitoring an effective facility construction safety program using a construction safety committee chaired by a member of management, or designee, composed of a Multi-disciplinary Team with representatives from the following program areas: Infection Control, Patient Safety, Occupational Safety and Health, VA Police, Engineering (Facilities Management), Engineering (Project Management), Green Environmental Management System (GEMS), Emergency Planning, Local Union Representatives, Employee Occupational Health, CSO, and Contracting.

(2) Ensuring that the Multi-disciplinary Team oversees:

(a) Protection of patients, visitors, and employees from injury and illness, as well as occupational and nosocomial infections related to construction activities.

(b) Compliance with Federal and state EPA and OSHA regulations.

(c) Compliance with FAR and VAAR in addressing a contractor's construction safety program.

(3) Developing and implementing a written policy addressing the responsibilities of the Multi-disciplinary Team and establishment of a Construction Safety Committee or subcommittee.

(4) Ensuring that the following VA staff complete OSHA's 30-hour Construction Safety training and, as a refresher, subsequently complete at least 10 hours of construction safety related training every 2 years:

(a) VHA Chief Engineers, COTR's Project Engineers, and Project Lead Persons;

(b) All members of the Multi-disciplinary Team; and

(c) CSO's and Facility Safety Program Managers.

l. **Multi-disciplinary Team**. The Multi-disciplinary Team is responsible for:

(1) Determining the scope and depth of safety, infection control, emergency management, and security responsibilities as appropriate for all construction work.

(2) Confirming compliance with applicable regulations, standards, and policies during the construction phase of the work.

(3) Conducting a pre-construction risk assessment to assess all hazards that affect health care, treatment, and services.

(a) Staff must conduct and document in writing pre-construction risk assessments during the design or planning stage of the construction project and or renovation. Pre-construction risk assessments need to be conducted prior to bidding, award, and starting work.

(b) Pre-construction risk assessments must focus on eliminating, or minimizing, the aforementioned risks during construction and renovation activities.

(4) Conducting a pre-construction risk assessment for the transmission of Tuberculosis (TB) to the contracted construction workers based upon the construction site location, patient population, hospital layout, and the defined risk as outlined in the "CDC Guidelines for preventing the transmission of Mycobacterium Tuberculosis in Health-Care Setting, 2005" (see subpar. 5v).

(5) Ensuring ILSMs are assessed and implemented on all construction work according to TJC standards. ILSMs are required when Life Safety Code deficiencies or construction activities pose significant hazards as determined by the assessment.

(6) Participating in all phases of construction work from planning through completion. This includes review and approval of construction plans, contract specifications, contract submittals related to construction safety and health, and any other documents that may assist in the implementation of an effective construction safety program. The Multi-disciplinary Team must be involved early in the process and continue oversight on a regular basis.

(7) Ensuring the Construction Safety Program includes periodic construction site hazard surveillance activities with appropriate membership, scope, and frequency for each project as determined by the CSO and the pre-construction risk assessment. Weekly surveillance activities are required with reports or checklists submitted to the CSO. In some cases daily inspections may be required by the CSA (e.g., construction activities capable of a HSCS accident).

NOTE: *Hazard Surveillance reports document non-compliant activities by daily inspection (minimum) until corrected as determined by the CSO. Reports include date, time, and members of the inspection team, deficiencies, type of corrective action, and time and date of correction. Hazard surveillance activities must be documented and tracked to completion.*

(8) Acting as members of the Construction Safety Committee or subcommittee and meeting at least monthly.

(9) Ensuring that documentation of the Team's inspections is provided to the CO or COTR, RE, and the VISN Safety and Health Staff, as requested.

m. **Facility VHA Chief Engineer.** The facility Chief Engineer is responsible for:

(1) Working with contractor and VHA facility staff to coordinate and monitor an effective construction safety program for projects under their direction.

(2) Acting as the Safety Officer in accordance with VAAR 836.236-87 and ensuring contractors comply with VA safety and health policies and procedures, and contract requirements.

(3) Serving on the facility Construction Safety Committee, or subcommittee, to ensure contracts meet the committee's requirements.

(4) Supporting the CSO, Facility Safety Manager, CO, and engineering staff in implementing the construction safety program.

n. **Contracting Officer (CO) and Contracting Officer's Technical Representative (COTR) or Project Engineer.** The CO and COTR or Project Engineer are responsible for:

(1) Ensuring that all solicitations and the clause found in VAAR 836.236-87.

(2) Designating, through a letter of delegation, the COTR, CSO, Chief Engineer, or Safety Program Manager to serve as the Safety Officer for VHA contracts.

(3) Adding subparagraph (f) of FAR 52.236-13, to the contract language, if the contract involves:

(a) Work of a long duration or hazardous nature; or

(b) Performance of a construction or renovation project on a Government facility that, on the advice of CO, COTR, or CSO involves hazardous materials or operations that might endanger the safety of the general public or Government personnel or property.

(4) Ensuring that all contracts and associated documents specify that all onsite contracted construction workers have completed the OSHA 10 hour Construction Safety training or the 30 hour Construction Safety training, and other relevant competency training, as determined by the COTR or CSO in coordination with the Multi-disciplinary Team. The determination for other relevant competency training is based on the project hazards and complexity, Federal and state regulations, and VA requirements.

(5) Ensuring that all projects require contractor verification of the completion of required training.

(6) Ensuring submittals for contract construction or renovation work to include the names, qualifications, and training dates for the contractor CP designated to administer the site-specific safety program, as well as the CP for other activities as required by OSHA regulation.

(7) Evaluating and considering past safety records of prospective contractors in awarding contracts. At a minimum, ensuring that all solicitations and contracts require documentation, to be supplied by potential contractors, that specifies the contractor in question has no more than three serious, or one repeat, or one willful OSHA or EPA violation(s) in the past 3 years and has an Experience Modification Rate (EMR) of equal to or less than 1.0.

(8) Serving on the facility Construction Safety Committee, or subcommittee, to ensure contracts meet the Committee's requirements.

(9) Ensuring that if contracted construction worker(s) have been determined to be at risk for transmission of TB to them based upon the TB pre-construction risk assessment,

(a) Then, the contractor must provide written certification that all contract employees assigned to the work site have had a pre-placement tuberculin screening within 90 days prior to assignment to the worksite and been found have negative TB screening reactions. Contractors will be required to show documentation of negative TB screening reactions for any additional workers who are added after the 90-day requirement before they will be allowed to work on the work site.

NOTE: *This can be the Center for Disease Control (CDC) and Prevention and two-step skin testing or a Food and Drug Administration (FDA)-approved blood test (see subpars. 5t and 5u).*

(b) Contract employees manifesting positive screening reactions to the tuberculin must be examined according to current CDC guidelines prior to working on VHA property.

(c) Subsequently, if the employee is found without evidence of active (infectious) pulmonary TB, a statement documenting examination by a physician must be on file with the employer (construction contractor), noting that the employee with a positive tuberculin screening test is without evidence of active (infectious) pulmonary TB.

(d) If the employee is found with evidence of active (infectious) pulmonary TB, the employee would require treatment with a subsequent statement to the fact on file with the employer before being allowed to return to work on VHA property.

o. **Construction Safety Officer (CSO).** CSO responsibilities include project submittal reviews of all construction projects and:

(1) Identifies work site risks.

(2) Collects deficiency information.

(3) Disseminates actions and results.

(4) Provides oversight of contract construction safety, and is knowledgeable in the general inspection of typical work sites during construction and renovation performed by contract staff, and in the review of contractor safety program submittals.

NOTE: *CSO(s) do not take the place of the contractor's CP or act on their behalf.*

(5) Determines if the contractor is meeting VA standards and contractual requirements for safety and OSHA compliance (Acting as the Safety Officer in accordance VAAR 836.236-87). When these standards and contract requirements are not being met, the VA COTR or CO, in coordination with the CSO must take immediate action to prevent injury, exposure, noncompliance, or property damage.

(6) Requires the contractor CP to implement and maintain an effective safety program that identifies and controls hazards that may cause injury or illness to VA patients, staff, visitors, and contractor employees; this includes:

(a) Ensures that the specific safety requirements for construction operations are implemented during facility projects.

(b) Participates in the VHA facility Multi-disciplinary Team established for the construction safety committee.

(c) Conducts periodic inspections of VHA construction sites to ensure compliance with safety elements of the established program(s), at a minimum weekly inspections are required.

NOTE: *REs are the Safety Officers for OOCFM managed construction sites and any associated inspections. Be aware that the TJC requires protection of all who enter VHA properties, and as such RE construction sites factor into accreditation.*

p. **GEMS Coordinator.** The GEMS Coordinator is responsible for providing guidance on EPA regulations that directly and immediately relate to the impacts that the project may have on the environment during the design or construction stage of the project.

q. **Emergency Planning Coordinator.** The Emergency Planning Coordinator is responsible for providing guidance on OSHA regulations as they apply to emergency planning, response, and operations in construction (e.g., 29 CFR 1926.35 and 29 CFR 1926.65).

r. **Construction Lead Person.** The construction lead person (VHA Engineering Supervisors, VHA Forepersons, Contractor's Superintendent, Contractor's Forepersons, and other assigned lead persons) is responsible for:

(1) Administering the site-specific construction safety program as the OSHA defined CP.
NOTE: *Inspections by CPs are required in accordance 29 CFR Part 1926.*

(2) Acting as the CP for other activities as required by OSHA regulations; including, but not limited to scaffolds, cranes, and excavations.

s. **Police and Security Officers.** The police and security officers are responsible for:

(1) Ensuring all contractors entering VHA properties comply with the Security Management Program. As a minimum, contractors must notify and obtain permission from the VA Police, be identified by project and employer, and be restricted from unauthorized areas.

(2) Providing consultation to the CSO, COTR, or other responsible staff in periodic surveillance of site security and the integrity of barriers to the construction site.

t. **Intervention Authority and Compliance.** CSO, authorized COs (or other personnel responsible through delegation of authority by the CO) with defined actions in this Directive are responsible for intervening whenever conditions, as a result of construction activities, immediately threaten life or health or threaten to damage equipment or buildings. Intervention authority and compliance with this Directive and the associated regulatory requirements are as follows:

(1) **Staff.** All staff are responsible for identifying hazardous conditions in need of intervention and for developing a culture of safety. Identified hazardous conditions must be communicated either orally or in a written format to authorized COs (or other personnel responsible through delegation of authority by the CO) who must take prompt corrective measures to include immediate abatement of hazards, stopping of work, hazard awareness training, administrative controls, etc.

(2) **Contractors.** Authorized COs (or other personnel responsible through delegation of authority by the CO) must notify the contractor both orally and in written forms of communication requesting

immediate initiation of corrective action of any hazards identified. After receiving the notice the contractor must immediately take corrective action.

(a) If the Contractor fails or refuses to promptly take corrective action, the CO may issue an order stopping all, or part, of the work until satisfactory corrective action has been taken (FAR 52.236-13).

(b) Upon a repeat offense of the same or substantially similar hazard, the CO, in coordination with the COTR or CSO, needs to follow the processes for the termination of the contract, if the situation is not resolved using the process outlined in FAR 36.513. The CO exclusively or in collaboration with other personnel responsible through delegation of authority by the CO is responsible for enforcement of the contract.

(c) The CSO with assistance from the COTR and the Multi-disciplinary Team is responsible for making the Contractor and CO formally aware of any hazard in need of correction.

5. REFERENCES

a. VHA Emerging Pathogens Guidebook, 1998, Center for Engineering and Occupational Safety and Health available electronically at: http://vaww.ceosh.med.va.gov/01HP/02HP_Guidebooks/03_Collections/04HP_EmergingPathogens/PDFContents/Ep.pdf . ***NOTE:*** *This is an internal Web site and is not available to the public.*

b. NFPA Codes and Standards, available at: http://vaww.ceosh.med.va.gov/01FS/pages/NFPAWarning.shtml . ***NOTE:*** *This is an internal Web site and is not available to the public.*

c. APIC Infection Control Tool Kit Series: Construction and Renovation, available from the Association of Professional Infection Control Practitioners and Epidemiologists.

d. Guidelines for Design and Construction of Hospital and Health Care Facilities, Facility Guidelines Institute 2010.

e. Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Dept. of Health, Bureau of Environmental and Occupational Disease Epidemiology, the website is: http://www.nyc.gov/html/doh/html/epi/moldrpt1.html.

f. Infection Control During Construction. A Guide to Prevention and JCAHO Compliance, Wayne Hansen, Editor, Opus Communications, 2002.

g. OSHA Regulations for Construction Safety, 29 CFR 1926, available at: http://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=STANDARDS&p_toc_level=1&p_keyvalue=Construction

h. U.S. Environmental Protection Agency Regulations, available at: http://www.epa.gov/lawsregs/bizsector/construction.html

i. Current Standards from The Joint Commission available at: http://vaww.archive.oqp.med.va.gov/oqp_services/accreditation/jcaho.asp . ***NOTE:*** *This is an internal Web site and is not available to the public.*

j. VHA Directive 7701, Occupational Safety and Health. http://vaww1.va.gov/vhapublications/ViewPublication.asp?pub_ID=240 . ***NOTE:*** *This is an internal Web site and is not available to the public.*

k. VHA Handbook 7701.01, Occupational Safety and Health Program Procedures. http://vaww1.va.gov/vhapublications/ViewPublication.asp?pub_ID=2282 . ***NOTE:*** *This is an internal Web site and is not available to the public.*

l. VA Directive 7700, Occupational Safety and Health. http://vaww1.va.gov/VASAFETY/SignedandDatedfinalSeventySevenHundred.pdf

m. Construction Safety Council, available at: http://www.buildsafe.org/.

n. U.S. CDC guidelines, available at: http://www.cdc.gov/niosh/docs/2004-146/ch4/ch4-2.asp.htm

o. Federal Acquisition Regulation, available at: http://www.acquisition.gov/far/

p. Veterans Affairs Acquisition Regulation, available at: http://www.va.gov/oamm/oa/ars/policyreg/vaar/vaar852.cfm

q. Veterans Affairs Resident Engineer Handbook available at: http://vaww.cfm.va.gov/RE/ . ***NOTE:*** *This is an internal Web site and is not available to the public.*

r. Veterans Affairs Project Manager Handbook available at: http://vaww.cfm.va.gov/RE/ ***NOTE:*** *This is an internal Web site and is not available to the public.*

6. FOLLOW-UP RESPONSIBILITY: The Deputy Under Secretary for Health for Operations and Management (10N) is responsible for VHA programs related to this Directive. The point of contact for technical and program issues related to this Directive is the Director, Occupational Safety and Health, Environmental, and Emergency Management (10NA8) at (202) 266-4547.

7. RECISSIONS: VHA Directive 2004-012, dated April 5, 2004, is rescinded. This VHA Directive expires September 30, 2016.

Robert A. Petzel, M.D.
Under Secretary for Health

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DEPARTMENT OF VETERANS AFFAIRS

VHA MASTER SPECIFICATIONS

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SECTION 00 01 15
LIST OF DRAWING SHEETS

The drawings listed below accompanying this specification form a part of the contract.

Drawing No.	Title
GS-000	COVER
GS-001	DRAWING INDEX-SYMBOLS-ABBREVIATIONS
AS-00G	LIFE SAFETY PLAN-GROUND FLOOR
AS-001	LIFE SAFETY PLAN-FIRST FLOOR
AS-002	LIFE SAFETY PLAN-SECOND FLOOR
AD-10B	BASEMENT DEMOLITION PLAN
AD-10G	GROUND FLOOR DEMOLITION PLAN
AD-101	FIRST FLOOR DEMOLITION PLAN
AD-102	SECOND FLOOR DEMOLITION PLAN
AD-10R	ROOF DEMOLITION PLAN
AS-20G	LABORATORY PLAN-GROUND FLOOR
AS-201	LABORATORY PLAN-FIRST FLOOR
AS-21B	BASEMENT FLOOR PLAN
AS-21G	GROUND FLOOR PLAN
AS-211	FIRST FLOOR PLAN
AS-212	SECOND FLOOR PLAN
AS-213	ROOF PLAN
AS-300	OPEN LAB ENLARGED REFLECTED CEILING PLAN
AS-31G	GROUND FLOOR REFLECTED CEILING PLAN
AS-311	FIRST FLOOR REFLECTED CEILING PLAN
AS-400	EXTERIOR ELEVATION-SOUTH
AS-401	EXTERIOR ELEVATION-EAST
AS-402	EXTERIOR ELEVATION-NORTH
AS-410	BUILDING ARCHITECTURAL SECTION-TRANSVERSE
AS-411	BUILDING ARCHITECTURAL SECTION-LONGITUDINAL
AS-420	WALL SECTIONS E & S WALLS
AS-421	WALL SECTIONS – MECHANICAL SHAFT E-W
AS-422	WALL SECTIONS – MECHANICAL SHAFT N-S
AS-423	DETAILS
AS-430	ENLARGED ARCHITECTURAL PLANS
AS-500	LABORATORY GENERAL NOTES-DETAILS
AS-50G.1	ENLARGED PLAN -LABORATORY GROUND FLOOR-PART 1
AS-50G.2	ENLARGED PLAN-LABORATORY GROUND FLOOR-PART 2
AS-501.1	ENLARGED PLAN-LABORATORY FIRST FLOOR-PART 1

- - - END - - -

SECTION 01 32 16.13
NETWORK ANALYSIS SCHEDULES

PART 1- GENERAL

1.1 DESCRIPTION:

A. The Contractor shall develop a Network Analysis System (NAS) plan and schedule demonstrating fulfillment of the contract requirements, shall keep the network 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) Precedence Diagramming Method (PDM) technique will be utilized to satisfy both time and cost applications. All schedule data and reports required under this specification section shall be based upon regular total float, not relative total float schedules.

1.2 CONTRACTOR'S REPRESENTATIVE:

A. The Contractor shall designate an authorized representative in the firm who will be responsible for the preparation of the network diagram, review and report progress of the project with and to the Contracting Officer's representative.

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 and such authority shall not be interrupted throughout the duration of the project.

1.3 CONTRACTOR'S CONSULTANT:

A. To prepare the network diagram, and compact disk(s), which reflects the Contractor's project plan, the Contractor shall engage an independent CPM consultant who is skilled in the time and cost application of scheduling using (PDM) network techniques for construction projects, the cost of which is included in the Contractor's bid. This consultant shall not have any financial or business ties to the Contractor, and shall not be an affiliate or subsidiary company of the Contractor, and shall not be employed by an affiliate or subsidiary company of the Contractor.

B. i) Prior to engaging a consultant, and within 10 calendar days after award of the contract, the Contractor shall submit to the Contracting Officer:

1. The name and address of the proposed consultant.
2. Sufficient information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
3. A list of prior construction projects, along with selected PDM network diagram samples on current projects which the proposed consultant has performed complete project scheduling services. These network diagram samples must show complete project planning for a project of similar size and scope as covered under this contract.

C. The Contracting Officer has the right to approve or disapprove employment of the proposed consultant, and will notify the Contractor of the VA decision within seven calendar days from receipt of information. In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor must have their CPM Consultant approved prior to // (i) submitting any diagram, (ii) completion of contract negotiations, (iii) submission of their best and final offer.//

1.4 COMPUTER PRODUCED SCHEDULES

A. The contractor shall provide to the VA, Senior Resident Engineer and CPM Schedule Analyst, monthly computer processing of 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 Primavera (P3 or P6) to the contracting officer’s representative; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data in Primavera (P3 or P6) batch format; and the resulting monthly updated schedule in a compressed electronic file in Primavera (P3 or P6), (PDM) format. These must be submitted with and substantively support the contractor’s monthly payment request and the signed lookahead report. The resident engineer shall identify the five different report formats that the contractor shall provide based upon the monthly schedule updates.

B. The contractor is responsible for the correctness and timeliness of the computer-produced reports. The Contractor is 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 shall report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor will reprocess the computer-produced reports and associated compact disk(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 NETWORK DIAGRAM SUBMITTAL

A. Within 45 calendar days (60 calendar days on projects over $50,000,000) after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the complete network diagram on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in a compressed Primavera (P3 or P6), (PDM) format. 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, duration, predecessor and successor relationships, trade code, area code, description, 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 and start-to-start without lead or lag constraints. The lead or lag for the SS relationships may only be allowed in limited basis if justified in writing and must be approved by the Contracting Officer. 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 network diagram 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 a zero duration. The complete working network diagram shall reflect the Contractor's approach to scheduling the complete project. **The final network diagram 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 network diagram has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

B. Within 30 calendar days after receipt of the complete project network diagram, 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 network diagram, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.

C. The approved baseline network diagram schedule and the corresponding computer-produced schedule(s) shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.

1.6 WORK ACTIVITY/EVENT COST DATA

A. The Contractor shall cost load all work activities/events except procurement activities. The cost loading shall reflect the appropriate level of effort of the work activities/events. 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. In the event of disapproval, the Contractor shall revise and resubmit in accordance with Article, THE COMPLETE PROJECT NETWORK DIAGRAM SUBMITTAL. 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 the FAR 52.232 – 5 (PAYMENTS UNDER FIXED-PRICE CONSTRUCTION), Article, and VAAR 852.236 - 83(PAYMENTS UNDER FIXED-PRICE CONSTRUCTION).

C. In accordance with Article PERFORMANCE OF WORK BY THE CONTRACTOR in FAR 52.236 – 1 and VAAR 852.236 - 72, 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 ASBESTOS ABATEMENT. The sum of asbestos abatement work activity/event costs shall equal the value of the asbestos bid item in the Contractors' bid.//

//E. The Contractor shall cost load work activities/events for all BID ITEMS. The sum of the cost loading for each bid item work activities/events shall equal the value of the item in the Contractors' bid.//

1.7 NETWORK DIAGRAM REQUIREMENTS

A. Show on the network diagram the sequence and interdependence of work activities/events required for complete performance of all items of work. In preparing the network diagram, the Contractor shall:

1. Exercise sufficient care to produce a clear, legible and accurate network diagram, refer to the drawing, CPM-1 (Sample CPM Network). Computer plotted network diagrams shall legibly display and plot all information required by the VA CPM activity/event legend or the computer plotted network diagram will not be acceptable. If the computer plotted network diagram is not found acceptable by the contracting officer’s representative, then the network diagram will need to be hand drafted and meet legibility requirements. Group activities related to specific physical areas of the project, on the

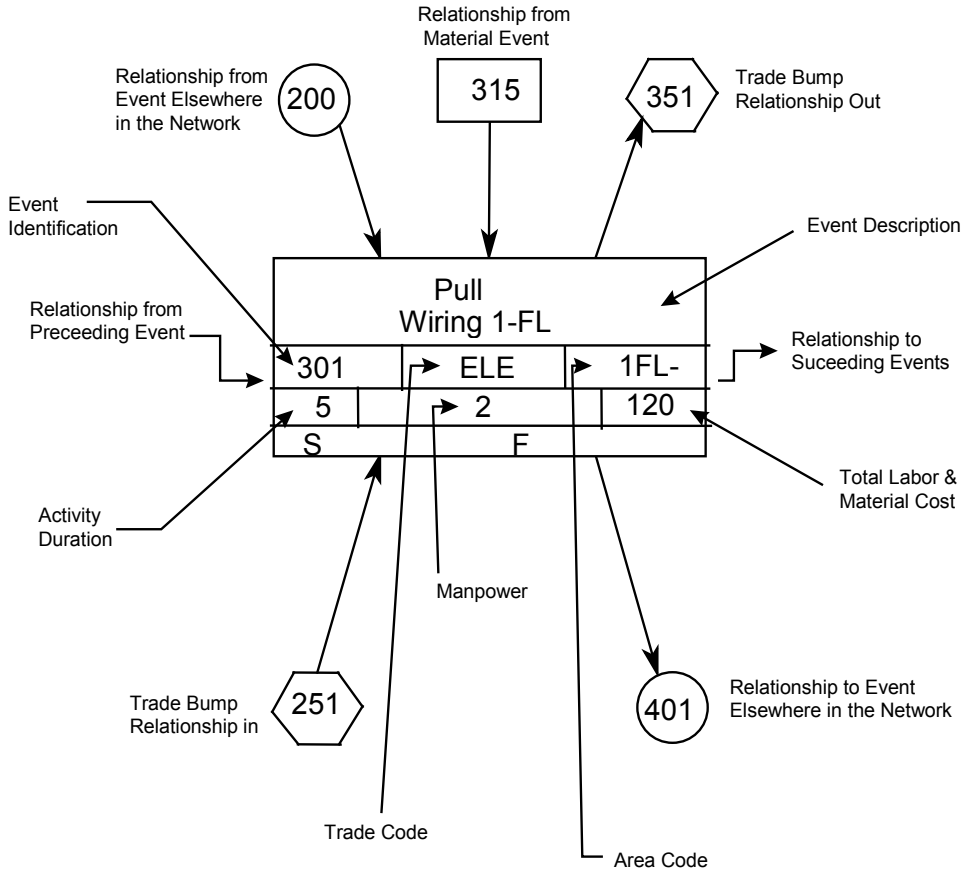
network diagram for ease of understanding and simplification. Provide a key plan on each network diagram sheet showing the project area associated with the work activities/events shown on that sheet.

2. Show the following on each work activity/event:
   a. Activity/Event ID number.
   b. Concise description of the work represented by the activity/event. (35 characters or less including spaces preferred).
   c. Performance responsibility or trade code (five alpha characters or less): GEN, MECH, ELEC, CARP, PLAST, or other acceptable abbreviations.
   d. Duration (in work days.)
   e. Cost (in accordance with Article, ACTIVITY/EVENT COST DATA of this section and less than $9,999,999 per activity).
   f. Work location or area code (five characters or less), descriptive of the area involved.
   g. Manpower required (average number of men per day).
   h. The SYMBOL LEGEND format shown below and on the drawing, CPM-1 (Sample CPM Network) is mandatory and shall be followed in

preparing final network diagrams.

SYMBOL LEGEND

Show Network Diagram page number location(s) for all incoming/outgoing node connector(s).



3. 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 Medical Center 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. **Commissioning Activities** – Based upon the project specific Commissioning plan and the specification section 01 91 00, the contractor shall include in the **Day 1 CPM Diagram all the systems commissioning activities (see systems covered in Division 7, 8, 21, 22, 23, 26, 28, 31 and others as specified)** such as start up, Pre-functional check list, Pre –test, individual component and system level Functional test, Operator's training, O.& M. Manuals etc.(including any deficiency correction and re-testing). **The majority of commissioning activities should be completed as part of the normal construction schedule and finalized prior to the construction contract completion date.** To this end, it is imperative that the Commissioning Agent and the Contractor collaborate to integrate commissioning activities into the Contractor's overall construction schedule. All commissioning activities shall be cost loaded as required in the earlier paragraphs.

f. The Commissioning Plan will identify critical commissioning activities and associated construction/start up tasks that must precede these activities to allow for successful execution of the commissioning activities. In order to coordinate these activities with the construction schedule, a **Commissioning Duration Schedule s**hould be provided by the Commissioning Agent to the VA RE and the Contractor to provide a rational basis for integration of commissioning into the Day 1 diagram and the construction schedule. The Commissioning Duration Schedule should include the following information:

   1) Description of Commissioning Activity
   2) Prerequisite Construction Tasks Required to Execute the Cx Activity
   3) Elapsed Time Duration of Each Activity
   4) Documentation Associated with Each Task/Document Responsibility

g. Once the duration schedule is delivered to the Contractor, the Commissioning Agent will collaborate with the Contractor to

integrate all commissioning activities into the fixed duration construction schedule in accordance with VA NAS requirements for scheduling the project.

h. 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. Schedule these activities/events so that only one phase is scheduled for completion within the same 30 consecutive calendar day period (except for those phases immediately preceding the final acceptance). Maintain this scheduling condition throughout the length of the contract unless waived by the Contracting Officer's representative in writing.

i. Work activities/events for the asbestos abatement bid item shall have a trade code of ASB.

j. Bid items other than the Base Bid (ITEM 1) and Asbestos Abatement item shall have trade codes corresponding to the appropriate bid item number (e.g., ITM 3, ITM 4 and other items).

4. 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.
5. Break up the work into activities/events of a duration no longer than 20 work days each, 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 Contracting Officer may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals shall not be less than 20 work days. Refer to drawing CPM-1 for VA approval activities/events which will require minimum duration longer than 20 workdays. The construction time as determined by the CPM schedule from early start to late finish for any sub-phase, phase or the entire project shall not exceed the contract time(s) specified or shown.

6. 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.
7. Uniquely number each activity/event with numbers ranging from 1 to 99998 only. The network diagram should be generally numbered in such a way to reflect either discipline, phase or location of the work.

B. Submit the following supporting data in addition to the network diagram, activity/event ID schedule and electronic file (s). Failure of the Contractor to include this data will delay the review of the submittal until the Contracting Officer is in receipt of the missing data:
1. The proposed number of working days per week.
2. The holidays to be observed during the life of the contract (by day, month, and year).
3. The planned number of shifts per day.
4. The number of hours per shift.
5. List the major construction equipment to be used on the site, describing how each piece relates to and will be used in support of the submitted network diagram work activities/events.
6. Provide a typed, doubled spaced, description, at least one page in length, of the plan and your approach to constructing the project.

C. To the extent that the network diagram or any revised network diagram shows anything not jointly agreed upon, it shall not be deemed to have been approved by the Contracting Officer. 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 Contracting Officer's approval of the network diagram.

D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA (Senior resident Engineer and CPM Schedule Analyst) an electronic file(s) containing one file of the data required to produce a Primavera (P3 or P6), (PDM) produced schedule, reflecting all the activities/events of the complete project network diagram 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 (PAYMENTS UNDER FIXED-PRICE CONSTRUCTION), and VAAR 852.236 - 83(PAYMENTS UNDER FIXED-PRICE CONSTRUCTION). The Contractor is entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated computer-produced calendar-dated schedule unless, in special situations, the Contracting Officer permits an exception to this requirement. Monthly payment requests shall include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of Primavera (P3 or P6), (PDM) to the contracting officer’s representative; a listing of all project schedule changes, and associated data, made at the update; and an electronic file (s) of the resulting monthly updated schedule in a compressed Primavera (P3 or P6), (PDM) format. These must be submitted with and substantively support the contractor’s monthly application and certificate for payment request documents.

B. When the Contractor fails or refuses to furnish to the Contracting Officer the information and the associated updated Primavera (P3 or P6), (PDM) schedule in electronic format, which, in the sole judgment of the Contracting Officer, is necessary for processing the monthly progress payment, the Contractor shall not be deemed to have provided an estimate and supporting schedule data upon which progress payment may be made.

1.9 PAYMENT AND PROGRESS REPORTING

A. Monthly job site progress meetings shall be held on dates mutually agreed to by the Contracting Officer (or Contracting Officer's representative) and the Contractor. Contractor and the CPM consultant will be required to attend all monthly progress meetings. Presence of Subcontractors during progress meeting is optional unless required by the Contracting Officer (or Contracting Officer's representative). The Contractor shall update the project schedule and all other data required by this section shall be accurately filled in and completed

prior to the monthly progress meeting. The Contractor shall provide this information to the Contracting Officer or the VA representative in completed form three work days in advance of the progress meeting. Job progress will be reviewed to verify:

1. Actual start and/or finish dates for updated/completed activities/events.
2. Remaining duration, required to complete 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 network diagram and computer-produced schedules. Changes in activity/event sequence and duration which have been made pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
4. Percentage for completed and partially completed activities/events.
5. Logic and duration revisions required by this section of the specifications.
6. Activity/event duration and percent complete shall be updated independently.

B. The Contractor shall submit a narrative report as a part of his monthly review and update, in a form agreed upon by the Contractor and the Contracting Officer. The narrative report shall include a description of problem areas; current and anticipated delaying factors and their estimated impact on performance of other activities/events and completion dates; and an explanation of corrective action taken or proposed. This report is in addition to the daily reports pursuant to the provisions of Article, DAILY REPORT OF WORKERS AND MATERIALS in the GENERAL CONDITIONS.

C. After completion of the joint review and the Contracting Officer's approval of all entries, the contractor will 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.

D. After completing the monthly schedule update, the contractor’s 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 consultant 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.**

E. After VA acceptance and approval of the final network diagram, and after each monthly update, the contractor shall submit to the Contracting Officer three blue line copies of a revised complete network diagram showing all completed and partially completed activities/events, contract changes and logic changes made on the intervening updates or at the first update on the final diagram. The Contracting Officer may elect to have the contractor do this on a less frequent basis, but it shall be done on a quarterly basis as a minimum.

F. 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. Whenever it becomes apparent from the current monthly progress review meeting or the monthly computer-produced calendar-dated 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 Contracting Officer for the proposed schedule changes. If such actions are approved, the CPM revisions shall be incorporated by the Contractor into the network diagram before the next update, at no additional cost to the Government.

1.11 CHANGES TO NETWORK DIAGRAM AND SCHEDULE

A. Within 30 calendar days after VA acceptance and approval of any updated computer-produced schedule, the Contractor will submit a revised network diagram, the associated compact disk(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, indicate an extension of the project completion by 20 working days or 10 percent of the remaining project duration, whichever is less. Such delays 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 of the network diagram 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 Medical Center, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, must be furnished in writing to the Contracting Officer for approval.

C. Contracting Officer's approval for the revised network diagram 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 network diagram resulting from contract changes will be included in the proposal for changes in work as specified in Article, FAR 52.243 -4 (CHANGES), VAAR 852.236 – 88 (CHANGES – SUPPLEMENTS), 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 network diagram 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 Contracting Officer 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 Article, FAR 52.243 -4 (CHANGES), VAAR 852.236 – 88 (CHANGES – SUPPLEMENTS). 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.

1.13 CONSTRUCTION SCHEDULE RISK ANALYSIS / MITIGATION PLAN

A. Schedule Risk Analysis – The contractor shall conduct the statistical schedule risk analysis based on the above detailed construction activities in the Day 1 approved diagram, identifying major schedule risk areas and recommended risk mitigation plans as outlined below.

B. The risk analysis shall be conducted by a person or firm skilled in the statistical method of schedule risk analysis based on the (PDM) network techniques for major construction projects, preferably in the major health care related projects. The cost of this service shall be included in the Contractor's proposal.

C. The Contracting Officer has the right to approve or disapprove the Person or firm designated to perform the risk analysis.

1.14 RISK ANALYSIS FORMAT / REQUIREMENTS / SUBMITTALS

A. Risk Analysis Software / Format - Within 45 calendar days (60 calendar days on projects over $50,000,000) after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; a

Risk Analysis software to be utilized, the method of performing the analysis, the format of presenting the data and the reports for VA approval.

B. Conduct Risk Analysis **/ Submittals - Based on the approved software / format, the consultant shall** perform statistical risk analysis on the detailed approved Day 1 diagram. The contractor shall review and utilize any previous Risk analysis performed by the A/E of record based on the "semi-detailed" (yet at an overall level) construction logic and schedule to ensure the continuity of previous schedule risk analysis. The contractor's project manager and Superintendent shall identify the major schedule risk areas and possible risk mitigation strategy/plan and record it in a narrative format, with **electronic file submission** to the VA. **The risk analysis exercise shall be performed or updated at least on a quarterly basis or as directed by the VA Contracting officer.**

C. The submittal shall include three copies of a computer-produced risk analysis results, predicting the various meaningful probability curves of achieving the contract schedules. It shall also include a detailed narrative list of all major and minor potential and specific schedule and cost risk areas, and a contractor's recommendations of mitigating the identified risks which must be addressed by the VA Project and Resident engineer teams to maintain the contract schedule.

- - - 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 (including laboratory samples to be tested), test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.

1-3. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:

A. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;
B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.

1-4. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals (including any laboratory samples to be tested) will not serve as a basis for extending contract time for completion.

1-5. Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by Resident Engineer on behalf of the Contracting Officer.

1-6. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.

1-7. The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefor by Contracting Officer, adjustment in contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.

1-8. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect- Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.

1-9. Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.

A. Submit samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.

B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.

1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.

3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.

C. In addition to complying with the applicable requirements specified in preceding Article 1.9, samples which are required to have Laboratory Tests (those preceded by symbol "LT" under the separate sections of the specification shall be tested, at the expense of Contractor, in a commercial laboratory approved by Contracting Officer.
   1. Laboratory shall furnish Contracting Officer with a certificate stating that it is fully equipped and qualified to perform intended work, is fully acquainted with specification requirements and intended use of materials and is an independent establishment in no way connected with organization of Contractor or with manufacturer or supplier of materials to be tested.
   2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.
   3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory.
   4. Contractor shall forward a copy of transmittal letter to Resident Engineer simultaneously with submission 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

Advetect

3800 Stillman Parkway, suite 203

Richmond, VA 23233

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.

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SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

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

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

A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to – GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.

B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

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

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

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

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

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

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

AABC Associated Air Balance Council
http://www.aabchq.com

AAMA American Architectural Manufacturer's Association
http://www.aamanet.org

AAN American Nursery and Landscape Association
http://www.anla.org

AASHTO American Association of State Highway and Transportation Officials
http://www.aashto.org

AATCC American Association of Textile Chemists and Colorists
http://www.aatcc.org

ACGIH American Conference of Governmental Industrial Hygienists
http://www.acgih.org

ACI American Concrete Institute
http://www.aci-int.net

ACPA American Concrete Pipe Association
http://www.concrete-pipe.org

ACPPA American Concrete Pressure Pipe Association
http://www.acppa.org

ADC Air Diffusion Council
http://flexibleduct.org

AGA American Gas Association
http://www.aga.org

AGC Associated General Contractors of America
http://www.agc.org

AGMA American Gear Manufacturers Association, Inc.
http://www.agma.org

AHAM Association of Home Appliance Manufacturers
http://www.aham.org

AISC American Institute of Steel Construction
http://www.aisc.org

AISI American Iron and Steel Institute
http://www.steel.org

AITC American Institute of Timber Construction
http://www.aitc-glulam.org

AMCA Air Movement and Control Association, Inc.
http://www.amca.org

ANLA American Nursery & Landscape Association
http://www.anla.org

ANSI American National Standards Institute, Inc.
http://www.ansi.org

APA The Engineered Wood Association
http://www.apawood.org

ARI Air-Conditioning and Refrigeration Institute
http://www.ari.org

ASAE American Society of Agricultural Engineers
http://www.asae.org

ASCE American Society of Civil Engineers
http://www.asce.org

ASHRAE American Society of Heating, Refrigerating, and Air-Conditioning Engineers
http://www.ashrae.org

ASME American Society of Mechanical Engineers
http://www.asme.org

ASSE American Society of Sanitary Engineering
http://www.asse-plumbing.org

ASTM American Society for Testing and Materials
http://www.astm.org

AWI Architectural Woodwork Institute
http://www.awinet.org

AWS American Welding Society
http://www.aws.org

AWWA American Water Works Association
http://www.awwa.org

BHMA Builders Hardware Manufacturers Association
http://www.buildershardware.com

BIA Brick Institute of America
http://www.bia.org

CAGI Compressed Air and Gas Institute
http://www.cagi.org

CGA Compressed Gas Association, Inc.
http://www.cganet.com

CI The Chlorine Institute, Inc.
http://www.chlorineinstitute.org

CISCA Ceilings and Interior Systems Construction Association
http://www.cisca.org

CISPI Cast Iron Soil Pipe Institute
http://www.cispi.org

CLFMI Chain Link Fence Manufacturers Institute
http://www.chainlinkinfo.org

CPMB Concrete Plant Manufacturers Bureau
http://www.cpmb.org

CRA California Redwood Association
http://www.calredwood.org

CRSI Concrete Reinforcing Steel Institute
http://www.crsi.org

CTI	Cooling Technology Institute http://www.cti.org
DHI	Door and Hardware Institute http://www.dhi.org
EGSA	Electrical Generating Systems Association http://www.egsa.org
EEI	Edison Electric Institute http://www.eei.org
EPA	Environmental Protection Agency http://www.epa.gov
ETL	ETL Testing Laboratories, Inc. http://www.et1.com
FAA	Federal Aviation Administration http://www.faa.gov
FCC	Federal Communications Commission http://www.fcc.gov
FPS	The Forest Products Society http://www.forestprod.org
GANA	Glass Association of North America http://www.cssinfo.com/info/gana.html/
FM	Factory Mutual Insurance http://www.fmglobal.com
GA	Gypsum Association http://www.gypsum.org
GSA	General Services Administration http://www.gsa.gov
HI	Hydraulic Institute http://www.pumps.org
HPVA	Hardwood Plywood & Veneer Association http://www.hpva.org

ICBO International Conference of Building Officials
http://www.icbo.org

ICEA Insulated Cable Engineers Association Inc.
http://www.icea.net

\ICAC Institute of Clean Air Companies
http://www.icac.com

IEEE Institute of Electrical and Electronics Engineers
http://www.ieee.org\

IMSA International Municipal Signal Association
http://www.imsasafety.org

IPCEA Insulated Power Cable Engineers Association

NBMA Metal Buildings Manufacturers Association
http://www.mbma.com

MSS Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
http://www.mss-hq.com

NAAMM National Association of Architectural Metal Manufacturers
http://www.naamm.org

NAPHCC Plumbing-Heating-Cooling Contractors Association
http://www.phccweb.org.org

NBS National Bureau of Standards
See - NIST

NBBPVI National Board of Boiler and Pressure Vessel Inspectors
http://www.nationboard.org

NEC National Electric Code
See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association
http://www.nema.org

NFPA National Fire Protection Association
http://www.nfpa.org

NHLA National Hardwood Lumber Association
http://www.natlhardwood.org

NIH National Institute of Health
http://www.nih.gov

NIST National Institute of Standards and Technology
http://www.nist.gov

NLMA Northeastern Lumber Manufacturers Association, Inc.
http://www.nelma.org

NPA National Particleboard Association
18928 Premiere Court
Gaithersburg, MD 20879
(301) 670-0604

NSF National Sanitation Foundation
http://www.nsf.org

NWWDA Window and Door Manufacturers Association
http://www.nwwda.org

OSHA Occupational Safety and Health Administration
Department of Labor
http://www.osha.gov

PCA Portland Cement Association
http://www.portcement.org

PCI Precast Prestressed Concrete Institute
http://www.pci.org

PPI The Plastic Pipe Institute
http://www.plasticpipe.org

PEI Porcelain Enamel Institute, Inc.
http://www.porcelainenamel.com

PTI Post-Tensioning Institute
http://www.post-tensioning.org

RFCI The Resilient Floor Covering Institute
http://www.rfci.com

RIS Redwood Inspection Service
See - CRA

RMA Rubber Manufacturers Association, Inc.
http://www.rma.org

SCMA Southern Cypress Manufacturers Association
http://www.cypressinfo.org

SDI Steel Door Institute
http://www.steeldoor.org

IGMA Insulating Glass Manufacturers Alliance
http://www.igmaonline.org

SJI Steel Joist Institute
http://www.steeljoist.org

SMACNA Sheet Metal and Air-Conditioning Contractors
National Association, Inc.
http://www.smacna.org

SSPC The Society for Protective Coatings
http://www.sspc.org

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

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

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

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

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

UBC The Uniform Building Code
See ICBO

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

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

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

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

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

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SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 APPLICABLE PUBLICATIONS:

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

B. American Association of State Highway and Transportation Officials (AASHTO):

T27-06.....Sieve Analysis of Fine and Coarse Aggregates

T96-02 (R2006).....Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

T99-01 (R2004).....The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop

T104-99 (R2003).....Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

T180-01 (R2004).....Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop

T191-02(R2006).....Density of Soil In-Place by the Sand-Cone Method

C. American Concrete Institute (ACI):

506.4R-94 (R2004).....Guide for the Evaluation of Shotcrete

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

A325-06.....Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

A370-07.....Definitions for Mechanical Testing of Steel Products

A416/A416M-06.....Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

A490-06.....Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength

C31/C31M-06.....Making and Curing Concrete Test Specimens in the Field

C33-03.....Concrete Aggregates

C39/C39M-05.....Compressive Strength of Cylindrical Concrete Specimens
C109/C109M-05.....Compressive Strength of Hydraulic Cement Mortars
C138-07.....Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
C140-07.....Sampling and Testing Concrete Masonry Units and Related Units
C143/C143M-05.....Slump of Hydraulic Cement Concrete
C172-07.....Sampling Freshly Mixed Concrete
C173-07.....Air Content of freshly Mixed Concrete by the Volumetric Method
C330-05.....Lightweight Aggregates for Structural Concrete
C567-05.....Density Structural Lightweight Concrete
C780-07.....Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C1019-08.....Sampling and Testing Grout
C1064/C1064M-05.....Freshly Mixed Portland Cement Concrete
C1077-06.....Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
C1314-07.....Compressive Strength of Masonry Prisms
D698-07.....Laboratory Compaction Characteristics of Soil Using Standard Effort
D1143-07.....Piles Under Static Axial Compressive Load
D1188-07.....Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D1556-07.....Density and Unit Weight of Soil in Place by the Sand-Cone Method
D1557-07.....Laboratory Compaction Characteristics of Soil Using Modified Effort
D2166-06.....Unconfined Compressive Strength of Cohesive Soil
D2167-94(R2001).....Density and Unit Weight of Soil in Place by the Rubber Balloon Method
D2216-05.....Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2922-05.....Density of soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D2974-07.....Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

D3666-(2002).....Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
D3740-07.....Minimum Requirements for Agencies Engaged in the Testing and Inspecting Road and Paving Material
E94-04.....Radiographic Testing
E164-03.....Ultrasonic Contact Examination of Weldments
E329-07.....Agencies Engaged in Construction Inspection and/or Testing
E543-06.....Agencies Performing Non-Destructive Testing
E605-93(R2006).....Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
E709-(2001).....Guide for Magnetic Particle Examination
E1155-96(R2008).....Determining FF Floor Flatness and FL Floor Levelness Numbers

E. American Welding Society (AWS):
D1.1-07.....Structural Welding Code-Steel

1.3 REQUIREMENTS:

A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E 329, C 1077, D 3666, D3740, A 880, E 543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."

B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Resident Engineer. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Resident Engineer to such failure.

C. Written Reports: Testing laboratory shall submit test reports to Resident Engineer, Contractor, unless other arrangements are agreed to in writing by the Resident Engineer. Submit reports of tests that fail to meet construction contract requirements on colored paper.

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EARTHWORK:

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

1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Resident Engineer extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.

2. Provide full time observation of fill placement and compaction and field density testing in building areas and provide full time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with ASTM D1557 Method A.
2. Make field density tests in accordance with the primary testing method following ASTM D2922 wherever possible. Field density tests utilizing ASTM D1556, or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Resident Engineer before the tests are conducted.

   a. Building Slab Subgrade: At least one test of subgrade for every 185 m^2 (2000 square feet) of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test

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

b. Foundation Wall Backfill: One test per 30 m (100 feet) of each layer of compacted fill but in no case fewer than two tests.

e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.

3.8 CONCRETE:

A. Batch Plant Inspection and Materials Testing:

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

B. Field Inspection and Materials Testing:

1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor’s expense. Any rejected concrete that is placed will be subject to removal.

3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 m^3 (50 cubic yards) or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. After good concrete quality control has been established and maintained as determined by Resident Engineer make three cylinders for each 80 m^3 (100 cubic yards) or less of each concrete type, and at least three cylinders from any one day's pour for each concrete type. Label each cylinder with an identification number. Resident Engineer may require additional cylinders to be molded and cured under job conditions.
4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day’s pumping operations to determine change in slump.
5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 20 m^3 (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m^3 (100 cubic yards) at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
9. Verify that specified mixing has been accomplished.
10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
    a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
    b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind

velocity; record maximum temperature of surface of hardened concrete.

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

C. Laboratory Tests of Field Samples:
1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as

directed by Resident Engineer. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.

2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
3. Furnish certified compression test reports (duplicate) to Resident Engineer. In test report, indicate the following information:
   a. Cylinder identification number and date cast.
   b. Specific location at which test samples were taken.
   c. Type of concrete, slump, and percent air.
   d. Compressive strength of concrete in MPa (psi).
   e. Weight of lightweight structural concrete in kg/m^3 (pounds per cubic feet).
   f. Weather conditions during placing.
   g. Temperature of concrete in each test cylinder when test cylinder was molded.
   h. Maximum and minimum ambient temperature during placing.
   i. Ambient temperature when concrete sample in test cylinder was taken.
   j. Date delivered to laboratory and date tested.

3.9 REINFORCEMENT:

A. Review mill test reports furnished by Contractor.
B. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.
C. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.
D. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

3.13 MASONRY:

A. Mortar Tests:
   1. Laboratory compressive strength test:
      a. Comply with ASTM C780.
      b. Obtain samples during or immediately after discharge from batch mixer.
      c. Furnish molds with 50 mm (2 inch), 3 compartment gang cube.
      d. Test one sample at 7 days and 2 samples at 28 days.
   2. Two tests during first week of operation; one test per week after initial test until masonry completion.

B. Grout Tests:
   1. Laboratory compressive strength test:
      a. Comply with ASTM C1019.
      b. Test one sample at 7 days and 2 samples at 28 days.
      c. Perform test for each 230 m^2 (2500 square feet) of masonry.
C. Masonry Unit Tests:
   1. Laboratory Compressive Strength Test:
      a. Comply with ASTM C140.
      b. Test 3 samples for each 460 m^2 (5000 square feet) of wall area.
D. Prism Tests: For each type of wall construction indicated, test masonry prisms per ASTM C1314 for each 460 m^2 (5000 square feet) of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3.14 STRUCTURAL STEEL:

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

f. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:
   1) 20 percent of all shear plate fillet welds at random, final pass only.
   2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
   3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
   4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
   5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.

g. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.

h. Welding Radiographic Testing: Test in accordance with ASTM E94, and AWS D1.1 for 5 percent of all full penetration welds at random.

i. Verify that correction of rejected welds are made in accordance with AWS D1.1.

j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.

2. Bolt Inspection:
   a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
   b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
   c. Fully Pre-tensioned Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in 25 percent of connections in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.

d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.

D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Resident Engineer.

3.15 STEEL DECKING:

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

3.16 SHEAR CONNECTOR STUDS:

A. Provide field inspection and testing services required by AWS D.1 to insure shear connector studs have been installed in accordance with contract documents.
B. Tests: Test 20 percent of headed studs for fastening strength in accordance with AWS D1.1.
C. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

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SECTION 01 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, // stream crossings, // material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and the Department of Veterans Affairs.

j. Environmental Monitoring Plans for the job site including land, water, air, and noise.

k. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.

B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.

B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Resident Engineer. Do not fasten or attach ropes, cables, or guys to

trees for anchorage unless specifically authorized, or where special emergency use is permitted.

1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
   a. Box and protect from damage existing trees and shrubs to remain on the construction site.
   b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
   c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
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.
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 // insert Name of State and title of State Air Pollution Statue, Rule, or Regulation // and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.

1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.

2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.

F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Resident Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified.

1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 //___//a.m. and 6:00//____//p.m unless otherwise permitted by local ordinance or the Resident Engineer. Repetitive impact noise on the property shall not exceed the following dB limitations:

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

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

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75

TRUCKS	75	ROCK DRILLS	80
PAVERS, STATIONARY	80	PNEUMATIC TOOLS	80
PUMPS	75	BLASTING	//--//
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

b. Use shields or other physical barriers to restrict noise transmission.
c. Provide soundproof housings or enclosures for noise-producing machinery.
d. Use efficient silencers on equipment air intakes.
e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
f. Line hoppers and storage bins with sound deadening material.
g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.

3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 // ____ // dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the Resident Engineer noting any problems and the alternatives for mitigating actions.

G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.

H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items

and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

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SECTION 01 58 16
TEMPORARY INTERIOR SIGNAGE

PART 1 GENERAL

DESCRIPTION

This section specifies temporary interior signs.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNS

A. Fabricate from 50 Kg (110 pound) mat finish white paper.

B. Cut to 100 mm (4-inch) wide by 300 mm (12 inch) long size tag.

C. Punch 3 mm (1/8-inch) diameter hole centered on 100 mm (4-inch) dimension of tag. Edge of Hole spaced approximately 13 mm (1/2-inch) from one end on tag.

D. Reinforce hole on both sides with gummed cloth washer or other suitable material capable of preventing tie pulling through paper edge.

E. Ties: Steel wire 0.3 mm (0.0120-inch) thick, attach to tag with twist tie, leaving 150 mm (6-inch) long free ends.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install temporary signs attached to room door frame or room door knob, lever, or pull for doors on corridor openings.

B. Mark on signs with felt tip marker having approximately 3 mm (1/8-inch) wide stroke for clearly legible numbers or letters.

C. Identify room with numbers as designated on floor plans.

3.2 LOCATION

A. Install on doors that have room, corridor, and space numbers shown.

B. Doors that do not require signs are as follows:

1. Corridor barrier doors (cross-corridor) in corridor with same number.
2. Folding doors or partitions.
3. Toilet or bathroom doors within and between rooms.
4. Communicating doors in partitions between rooms with corridor entrance doors.
5. Closet doors within rooms.

C. Replace missing, damaged, or illegible signs.

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SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.

B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.

C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:

1. Waste Management Plan development and implementation.
2. Techniques to minimize waste generation.
3. Sorting and separating of waste materials.
4. Salvage of existing materials and items for reuse or resale.
5. Recycling of materials that cannot be reused or sold.

D. At a minimum the following waste categories shall be diverted from landfills:

1. Soil.
2. Inerts (eg, concrete, masonry and asphalt).
3. Clean dimensional wood and palette wood.
4. Green waste (biodegradable landscaping materials).
5. Engineered wood products (plywood, particle board and I-joists, etc).
6. Metal products (eg, steel, wire, beverage containers, copper, etc).
7. Cardboard, paper and packaging.
8. Bitumen roofing materials.
9. Plastics (eg, ABS, PVC).
10. Carpet and/or pad.
11. Gypsum board.
12. Insulation.
13. Paint.
14. Fluorescent lamps.

1.2 RELATED WORK

A. Section 02 41 00, DEMOLITION.

B. Section 01 00 00, GENERAL REQUIREMENTS.

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

1.3 QUALITY ASSURANCE

A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
   1. Excess or unusable construction materials.
   2. Packaging used for construction products.
   3. Poor planning and/or layout.
   4. Construction error.
   5. Over ordering.
   6. Weather damage.
   7. Contamination.
   8. Mishandling.
   9. Breakage.

B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.

C. Contractor shall develop and implement procedures to reuse and recycle new materials to a minimum of 50 percent.

D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.

E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website http://www.wbdg.org provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.

F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.

H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.

B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.

C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.

D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.

E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).

F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.

G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.

H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.

I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.

J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.

K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.

L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
   1. On-site Recycling – Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
   2. Off-site Recycling – Materials hauled to a location and used in an altered form in the manufacture of new products.

M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.

N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.

O. Return: To give back reusable items or unused products to vendors for credit.

P. Salvage: To remove waste materials from the site for resale or re-use by a third party.

Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.

R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.

S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:

B. Prepare and submit to the 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 91 00

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS shall form the basis of the construction phase commissioning process and procedures. The Commissioning Agent shall add, modify, and refine the commissioning procedures, as approved by the Department of Veterans Affairs (VA), to suit field conditions and actual manufacturer's equipment, incorporate test data and procedure results, and provide detailed scheduling for all commissioning tasks.

B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the Division 7, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of these specifications are intended to be provided in coordination with the commissioning services and are not intended to duplicate services. The Contractor shall coordinate the work required by individual specification sections with the commissioning services requirements specified herein.

C. Where individual testing, adjusting, or related services are required in the project specifications and not specifically required by this commissioning requirements specification, the specified services shall be provided and copies of documentation, as required by those specifications shall be submitted to the VA and the Commissioning Agent to be indexed for future reference.

D. Where training or educational services for VA are required and specified in other sections of the specifications, including but not limited to Division 7, Division 8, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of the specification, these services are intended to be provided in addition to the training and educational services specified herein.

E. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the VA’s operational needs. The commissioning process shall

encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction, and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:

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

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.

E. Section 23 08 00 COMMISSIONING OF HVAC 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.

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:

4. HVAC (Division 23)

a. Air Handling Systems (including terminal unis and energy recovery units)

b. 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 (controls, gages and instrumentation, and safety relief valves).
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).
j. Laboratory Exhaust Systems (Fume hoods, pressure controls, system alarms, fans, motors, and Variable Speed Drives).
k. Laboratory Ventilation Systems (Supply air terminal units and controls, pressure controls and alarms, fans, motors, and Variable Speed Drives).
o. Room Pressurization Equipment (Pressure sensors, terminal units/dampers, and controls and alarms).

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 //XX// 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 //XX// 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_2 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.

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:
   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.

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

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.
2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.

h. Normal shutdown instructions.

i. Operating procedures for emergencies.

j. Operating procedures for system, subsystem, or equipment failure.

k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.

m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.

b. Checking adjustments.

c. Noise and vibration adjustments.

d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.

b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.

b. Types of cleaning agents to be used and methods of cleaning.

c. List of cleaning agents and methods of cleaning detrimental to product.

d. Procedures for routine cleaning

e. Procedures for preventive maintenance.

f. Procedures for routine maintenance.

g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.

b. Repair instructions.

c. Disassembly; component removal, repair, and replacement; and reassembly instructions.

d. Instructions for identifying parts and components.

e. Review of spare parts needed for operation and maintenance.

H. Training Execution:

1. Preparation: Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual. Set up instructional equipment at instruction location.

2. Instruction:

a. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Department of Veterans Affairs for number of participants, instruction times, and location.

b. Instructor: Engage qualified instructors to instruct VA's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1) The Commissioning Agent will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.

2) The VA will furnish an instructor to describe VA's operational philosophy.

3) The VA will furnish the Contractor with names and positions of participants.

3. Scheduling: Provide instruction at mutually agreed times. For equipment that requires seasonal operation, provide similar instruction at start of each season. Schedule training with the VA and the Commissioning Agent with at least seven days' advance notice.

4. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of **an oral**, **or a written**, performance-based test.

5. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

I. Demonstration and Training Recording:

1. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.

2. Video Format: Provide high quality color DVD color on standard size DVD disks.

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

----- END -----

SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies demolition and removal of portions of buildings, utilities, other structures as shown and as required for the work of this Contract.

1.2 RELATED WORK:

A. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.

B. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.

C. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.

D. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

E. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.

1.3 PROTECTION:

A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.

B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.

C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.

D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.

E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.

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

G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the // Medical Center any damaged items shall be repaired or replaced as approved by the 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.

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.

B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Break up concrete slabs below grade

that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.

C. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.

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

3.2 CLEAN-UP:

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

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SECTION 03 30 53
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

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

1.3 TOLERANCES:

A. ACI 117.

B. Slab Finishes: ACI 117, F-number method in accordance with ASTM E1155.

1.4 REGULATORY REQUIREMENTS:

A. ACI SP-66 ACI Detailing Manual

B. ACI 318 - Building Code Requirements for Reinforced Concrete.

1.5 SUBMITTALS:

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

B. Concrete Mix Design.

C. Shop Drawings: Reinforcing steel: Complete shop drawings.

D. Manufacturer's Certificates: Air-entraining admixture, chemical admixtures, curing compounds.

1.6 APPLICABLE PUBLICATIONS:

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

B. American Concrete Institute (ACI):

117R-06.....Tolerances for Concrete Construction and Materials

211.1-91(R2002).....Proportions for Normal, Heavyweight, and Mass Concrete

211.2-98(R2004).....Proportions for Structural Lightweight Concrete

301-05.....Specification for Structural Concrete

305R-06.....Hot Weather Concreting

306R-2002.....Cold Weather Concreting

SP-66-04 .....ACI Detailing Manual

318/318R-05.....Building Code Requirements for Reinforced Concrete

347R-04.....Guide to Formwork for Concrete

C. American Society for Testing And Materials (ASTM):

A185-07.....Steel Welded Wire, Fabric, Plain for Concrete Reinforcement

A615/A615M-08.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

A996/A996M-06.....Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

C31/C31M-08.....Making and Curing Concrete Test Specimens in the Field

C33-07.....Concrete Aggregates

C39/C39M-05.....Compressive Strength of Cylindrical Concrete Specimens

C94/C94M-07.....Ready-Mixed Concrete

C143/C143M-05.....Standard Test Method for Slump of Hydraulic Cement Concrete

C150-07.....Portland Cement

C171-07.....Sheet Material for Curing Concrete

C172-07.....Sampling Freshly Mixed Concrete

C173-07.Air Content of Freshly Mixed Concrete by the Volumetric Method

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

C231-08.....Air Content of Freshly Mixed Concrete by the Pressure Method

C260-06.....Air-Entraining Admixtures for Concrete

C330-05.....Lightweight Aggregates for Structural Concrete

C494/C494M-08.....Chemical Admixtures for Concrete

C618-08.....Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

D1751-04.Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

D4397-02.....Polyethylene Sheeting for Construction, Industrial and Agricultural Applications

E1155-96(2008).....Determining F_F Floor Flatness and F_L Floor Levelness Numbers

PART 2 - PRODUCTS

2.1 FORMS:

Wood, plywood, metal, or other materials, approved by Resident Engineer, of grade or type suitable to obtain type of finish specified.

2.2 MATERIALS:

A. Portland Cement: ASTM C150, Type I or II.

B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalis, and loss on ignition (LOI) not to exceed 5 percent.

C. Coarse Aggregate: ASTM C33, Size 67. Size 467 may be used for footings and walls over 300 mm (12 inches) thick. Coarse aggregate for applied topping and metal pan stair fill shall be Size 7.

D. Fine Aggregate: ASTM C33.

E. Lightweight Aggregate for Structural Concrete: ASTM C330, Table 1

F. Mixing Water: Fresh, clean, and potable.

G. Air-Entraining Admixture: ASTM C260.

H. Chemical Admixtures: ASTM C494.

I. Vapor Barrier: ASTM D4397, 0.25 mm (10 mil).

J. Reinforcing Steel: ASTM A615 or ASTM A996, deformed. See structural drawings for grade.

K. Welded Wire Fabric: ASTM A185.

L. Expansion Joint Filler: ASTM D1751.

M. Sheet Materials for Curing Concrete: ASTM C171.

N. Abrasive Aggregates: Aluminum oxide grains or emery grits.

O. Liquid Densifier/Sealer: 100 percent active colorless aqueous siliconate solution.

P. Grout, Non-Shrinking: Premixed ferrous or non-ferrous, mixed and applied in accordance with manufacturer's recommendations. Grout shall show no settlement or vertical drying shrinkage at 3 days or thereafter based on initial measurement made at time of placement, and produce a compressive strength of at least 18mpa (2500 psi) at 3 days and 35mpa (5000 psi) at 28 days.

2.3 CONCRETE MIXES:

A. Design of concrete mixes using materials specified shall be the responsibility of the Contractor as set forth under Option C of ASTM C94.

B. Compressive strength at 28 days shall be not less than 4000 psi.

C. Establish strength of concrete by testing prior to beginning concreting operation. Test consists of average of three cylinders made and cured in accordance with ASTM C192 and tested in accordance with ASTM C39.

D. Maximum slump for vibrated concrete is 100 mm (4 inches) tested in accordance with ASTM C143.

E. Cement and water factor (See Table I):

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete: Strength	Non-Air-Entrained		Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/m^3 (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m^3 (lbs/c. yd)	Max. Water Cement Ratio
35 (5000)[1,3]	375 (630)	0.45	385 (650)	0.40
30 (4000)[1,3]	325 (550)	0.55	340 (570)	0.50
25 (3000)[1,3]	280 (470)	0.65	290 (490)	0.55
25 (3000)[1,2]	300 (500)	*	310 (520)	*

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f’c.

* Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.

F. Air-entrainment is required for all exterior concrete. Air content shall conform with the following tables :

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

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

TABLE II TOTAL AIR CONTENT
AIR CONTENT OF LIGHTWEIGHT STRUCTURAL CONCRETE

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

2.4 BATCHING & MIXING:

A. Store, batch, and mix materials as specified in ASTM C94.
   1. Job-Mixed: Concrete mixed at job site shall be mixed in a batch mixer in manner specified for stationary mixers in ASTM C94.
   2. Ready-Mixed: Ready-mixed concrete comply with ASTM C94, except use of non-agitating equipment for transporting concrete to the site will not be permitted. With each load of concrete delivered to project, ready-mixed concrete producer shall furnish, in duplicate, certification as required by ASTM C94.
   3. Mixing structural lightweight concrete: Charge mixer with 2/3 of total mixing water and all of the aggregate. Mix ingredients for not less than 30 seconds in a stationary mixer or not less than 10 revolutions at mixing speed in a truck mixer. Add remaining mixing water and other ingredients and continue mixing. Above procedure may be modified as recommended by aggregate producer.

PART 3 - EXECUTION

3.1 FORMWORK:

A. Installation conform to ACI 347. Sufficiently tight to hold concrete without leakage, sufficiently braced to withstand vibration of concrete, and to carry, without appreciable deflection, all dead and live loads to which they may be subjected.
B. Treating and Wetting: Treat or wet contact forms as follows:
   1. Coat plywood and board forms with non-staining form sealer. In hot weather cool forms by wetting with cool water just before concrete is placed.
   2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather cool metal forms by thoroughly wetting with water just before placing concrete.
   3. Use sealer on reused plywood forms as specified for new material.
C. Inserts, sleeves, and similar items: Flashing reglets, masonry ties, anchors, inserts, wires, hangers, sleeves, boxes for floor hinges and other items specified as furnished under this and other sections of specifications and required to be in their final position at time concrete is placed shall be properly located, accurately positioned and built into construction, and maintained securely in place.
D. Construction Tolerances:
   1. Contractor is responsible for setting and maintaining concrete formwork to assure erection of completed work within tolerances specified to accommodate installation or other rough and finish materials. Remedial work necessary for correcting excessive

tolerances is the responsibility of the Contractor. Erected work that exceeds specified tolerance limits shall be remedied or removed and replaced, at no additional cost to the Government.

2. Permissible surface irregularities for various classes of materials are defined as "finishes" in specification sections covering individual materials. They are to be distinguished from tolerances specified which are applicable to surface irregularities of structural elements.

3.2 REINFORCEMENT:

Details of concrete reinforcement, unless otherwise shown, in accordance with ACI 318 and ACI SP-66. Support and securely tie reinforcing steel to prevent displacement during placing of concrete.

3.3 VAPOR BARRIER:

Except where membrane waterproofing is required, place interior concrete slabs-on-grade on a continuous vapor barrier.

A. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.
B. Lap joints 150 mm (6 inches) and seal with a compatible pressure-sensitive tape.
C. Patch punctures and tears.

3.4 PLACING CONCRETE:

A. Remove water from excavations before concrete is placed. Remove hardened concrete, debris and other foreign materials from interior of forms, and from inside of mixing and conveying equipment. Obtain approval of Resident Engineer before placing concrete. Provide screeds at required elevations for concrete slabs.
B. Before placing new concrete on or against concrete which has set, existing surfaces shall be roughened and cleaned free from all laitance, foreign matter, and loose particles.
C. Convey concrete from mixer to final place of deposit by method which will prevent segregation or loss of ingredients. Do not deposit in work concrete that has attained its initial set or has contained its water or cement more than 1 1/2 hours. Do not allow concrete to drop freely more than 1500 mm (5 feet) in unexposed work nor more than 900 mm (3 feet) in exposed work. Place and consolidate concrete in horizontal layers not exceeding 300 mm (12 inches) in thickness. Consolidate concrete by spading, rodding, and mechanical vibrator. Do not secure vibrator to forms or reinforcement. Vibration shall be carried on continuously with placing of concrete.

D. Hot weather placing of concrete: Follow recommendations of ACI 305R to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete.

E. Cold weather placing of concrete: Follow recommendations of ACI 306R, to prevent freezing of thin sections less than 300 mm (12 inches) and to permit concrete to gain strength properly, except that use of calcium chloride shall not be permitted without written approval from Resident Engineer.

3.5 PROTECTION AND CURING:

Protect exposed surfaces of concrete from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by Resident Engineer.

3.6 FORM REMOVAL:

Forms remain in place until concrete has a sufficient strength to carry its own weight and loads supported. Removal of forms at any time is the Contractor's sole responsibility.

3.7 SURFACE PREPARATION:

Immediately after forms have been removed and work has been examined and approved by Resident Engineer, remove loose materials, and patch all stone pockets, surface honeycomb, or similar deficiencies with cement mortar made with 1 part portland cement and 2 to 3 parts sand.

3.8 FINISHES:

A. Vertical and Overhead Surface Finishes:

1. Unfinished Areas: Vertical and overhead concrete surfaces exposed in unfinished areas, above suspended ceilings in manholes, and other unfinished areas exposed or concealed will not require additional finishing.
2. Interior and Exterior Exposed Areas (to be painted): Fins, burrs and similar projections on surface shall be knocked off flush by mechanical means approved by Resident Engineer and rubbed lightly with a fine abrasive stone or hone. Use an ample amount of water during rubbing without working up a lather of mortar or changing texture of concrete.

B. Slab Finishes:

2. Floating: Allow water brought to surface by float used for rough finishing to evaporate before surface is again floated or troweled. Do not sprinkle dry cement on surface to absorb water.

3. Float Finish: Ramps, stair treads, and platforms, both interior and exterior, equipment pads, and slabs to receive non-cementitious materials, except as specified, shall be screened and floated to a smooth dense finish. After first floating, while surface is still soft, surfaces shall be checked for alignment using a straightedge or template. Correct high spots by cutting down with a trowel or similar tool and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections on floated finish by rubbing or dry grinding. Refloat the slab to a uniform sandy texture.
4. Steel Trowel Finish: Applied toppings, concrete surfaces to receive resilient floor covering or carpet, future floor roof and all monolithic concrete floor slabs exposed in finished work and for which no other finish is shown or specified shall be steel troweled. Final steel troweling to secure a smooth, dense surface shall be delayed as long as possible, generally when the surface can no longer be dented with finger. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure on trowel to compact cement paste and form a dense, smooth surface. Finished surface shall be free of trowel marks, uniform in texture and appearance.
6. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:

Slab on grade & Shored suspended slabs		Unshored suspended slabs	
Specified overall value	F_F 25/F_L 20	Specified overall value	F_F 25
Minimum local value	F_F 17/F_L 15	Minimum local value	F_F 17

3.9 SURFACE TREATMENTS:

A. Surface treatments shall be mixed and applied in accordance with manufacturer's printed instructions.
B. Liquid Densifier/Sealer: Use on all exposed concrete floors and concrete floors to receive carpeting and vinyl competition tile.

3.10 TRENCHING AND EXCAVATAION AT EXISTING SLABS:

Remove existing flooring, concrete slab and base aggregate in locations shown on the Drawings and as required for new work below existing concrete slab system. Backfill and compact base aggregate to top of existing base aggregate. Place new concrete flush with top of adjacent

slab and finish as specified elsewhere in this Section for type of finish flooring to be patched.

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SECTION 033619
PENETRATING REACTIVE CONCRETE STAIN

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Water-based reactive stained concrete floor finish.
2. Sealer.

1.2 REFERENCES

A. ASTM International (ASTM):

1. ASTM C 171: Standard Specification for Sheet Materials for Curing Concrete.
2. ASTM C 309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

B. International Concrete Repair Institute (ICRI):

1. ICRI Technical Guidelines: Series 300 - Concrete, Designation 310 - Surface Preparation.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical data, including Material Safety Data Sheet (MSDS) and installation instructions, for each product specified.

B. Samples for Initial Selection: Manufacturer’s color charts showing full range of colors available.

C. Qualification Data: For manufacturer and Installer.

D. Moisture Vapor Emission Rate test results

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 years of documented experience producing the specified products.

B. Installer Qualifications: Minimum 5 years of documented experience with work of similar scope and complexity required by this Project and acceptable to, or certified by, concrete stain manufacturer.

C. Regulatory Requirements:

1. Products to comply with United States Clean Air Act for maximum Volatile Organic compound (VOC) content as specified in this Section.

D. Material Source Limitations: Obtain each specified material from the same source.

E. Notification: Give a minimum 7 calendar days' notice to manufacturer's authorized field representative before date established for commencement of concrete stain work.

F. Concrete Stain Tests:

1. Test concrete stain colors selected in an inconspicuous area selected by the Architect for approval prior to beginning stain operations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original factory unopened, undamaged packaging bearing identification of product, manufacturer, batch number, and expiration date as applicable.

B. Store products in a location protected from damage, construction activity, and adverse environmental conditions, and away from combustible materials and sources of heat, according to manufacturer's printed instructions and current recommendations.

C. Handle products according to manufacturer's printed instructions.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Maintain an ambient temperature between 50 deg F and 90 deg F during application and at least 48 hours after application. Do not proceed with exterior applications during rainy, foggy, or very humid weather.

1.7 TESTING

A. Test concrete surface to be stained and sealed in accordance with manufacturer's recommendations.
1. Moisture Vapor Emission Rate must be within acceptable tolerance before proceeding with stain and sealer

1.8 PREINSTALLATION CONFERENCE

A. Seven calendar days prior to scheduled date of installation, conduct a meeting at Project site to discuss requirements, including application methods. Attendees to include Architect, Owner, Contractor, Installer, and manufacturer's authorized field representative.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design: Provide products specified herein manufactured by L. M. Scofield Company (Scofield).

2.2 MATERIALS

A. Water-Based Reactive Chemical Concrete Stain: Penetrating reactive water-based staining product that chemically bonds to cured concrete or cementitious topping substrates to produce permanent translucent color effects. Less than 100 g/L VOC content.

1. Product: Scofield's "LITHOCHROME Tintura Stain."
2. Color(s): selected from full range of manufacturer's colors for pastel, vivid and earth tone colors.

B. Sealers – water based, low VOC, clear :
   a. SCOFIELD® Selectseal-W™
   b. Number of Coats: 2 minimum

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which the concrete stain work will be performed and identify conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation for New or Existing Concrete:

1. Concrete surfaces should be completely penetrable before applying the initial application of chemical stain. The surface of the concrete should be lightly mechanically abraded to remove weak cement paste and contaminants. The final surface preparation should approximate a Concrete Surface Profile of 1, (CSP1 as designated by the International Concrete Repair Institute, Alexandria, Virginia). Methods for mechanical abrasion include:
   a. Pressure Washing: Use a pressure washer equipped with a fan tip and rated for a minimum pressure capability of 4000 psi.
   b. Scrubbing with a rotary floor machine with a Mal-Grit Brush from the Malish Corporation.
   c. Light sanding of the surface.

   Surfaces should be tested to receive stain by spotting with water. Water should immediately darken the substrate and be

readily absorbed. If water beads and does not penetrate or only penetrates in some areas, perform additional surface preparation and testing. On denser concrete floors, sand lightly to open up surfaces. Retest and continue surface preparation until water spots immediately darken and uniformly penetrate concrete surfaces.

2. Rinse concrete substrates until rinse water is completely clean.

B. Completed preparation to result in concrete surfaces that are uniformly slip-resistant and profiled to meet a Concrete Surface Preparation (CSP) of 1-2 according to referenced ICRI guidelines.

C. Protect adjacent surfaces from damage during concrete staining and sealing operations.

3.3 CONCRETE STAIN APPLICATION

A. Protect surrounding areas, landscaping, and adjacent surfaces from overspray, runoff, and tracking. Divide surfaces into small work sections using walls, joint lines, or other stationary breaks as natural stopping points.

B. Apply concrete stains full strength (undiluted) at the coverage rate recommended by the manufacturer and use application equipment according to the concrete stain manufacturer’s printed instructions. Note the color of the liquid chemical stain will not be the final color produced on the concrete substrate.

1. Thoroughly power mix concrete stain base and tint materials immediately prior to use. For mixing stain materials, use an acceptable metal blade mixer.

C. Apply water-based reactive stain to substrates with an airless sprayer or High Volume Low Pressure (HVLP) sprayer, with a maintained and overlap controlled wet edge. A roller may also be used to apply material. If an airless sprayer or HVLC sprayer is used, the material may be manipulated mechanically to create a variegated appearance similar to that of an acid stain. If a roller is used an opaque monochromatic appearance will result.

1. Airless Sprayer: 1500 to 2500 psi variable outlet fluid pressure. 0.013 to 0.018 inch tip.
2. HVLP Sprayer: 5 to 40 psi spray pressure capability.

D. Reaction time will depend of wind conditions, temperature, and humidity level.

E. If required, apply a second coat after first coat has sufficiently dried and can be walked on without damage; normally two to four hours after application depending on temperature and humidity. Apply a third coat, if required, not less than two to four hours after the second coat application.

3.4 SEALER APPLICATION

A. Concrete substrate must be completely dry.

B. After the final penetrating stain application has dried sufficiently, normally 8 to 24 hours at 75 degrees F and 50 percent relative humidity, remove all contaminants from surfaces by dry mopping if required.

C. Apply sealer according the sealer manufacturer's printed instructions at a rate of 300 to 500 square feet per gallon per coat, maintaining a wet edge at all times. Two coats are required. Maintain a wet edge at all times.

D. Allow sealer to completely dry before applying additional coats.

E. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.

F. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.5 PROTECTION

A. The General Contractor is responsible for using Temporary Floor Protection throughout the project to safeguard the surface quality of concrete slabs before and after application of decorative finishes or installations of other materials.

B. All concrete floors that will be not be covered by other materials will be protected throughout the project. The concrete slab must be treated as a finished floor at all times during construction.

C. Temporary Floor Protection will be removed only while finish work to the concrete is being performed and will be replaced after the final finish has cured sufficiently.

D. Temporary Floor Protection will be Proguard Duracover as manufactured by L. M. Scofield Company, Douglasville, GA (800-800-9900). Seaming of the temporary floor protection will be performed with Scofield Proguard Heavy Duty Seaming Tape. Both products will be installed following the manufacturer's published installation procedures.

E. DO NOT APPLY THE HEAVY DUTY SEAMING TAPE TO BARE OR FINISHED FLOORS OR WALL SURFACES AT ANY TIME. IT WILL PERMANENTLY DAMAGE THE FLOOR

3.6 MAINTENANCE

A. Maintain water-based reactive stained and sealed floors by sweeping. Clean spills when they occur and rinse dirt off with water. Wet-clean heavily soiled areas by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality

commercial detergent. Maintain interior floors that require polishing by using a compatible, premium-grade, emulsion-type, commercial floor polish, according to manufacturer's printed instructions and safety requirements.

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SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for construction of masonry unit walls.

1.2 RELATED WORK

A. Steel lintels and shelf angles: Section 05 50 00, METAL FABRICATIONS.
B. Cavity insulation: Section 07 21 13, THERMAL INSULATION.
C. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.
D. Sealants and sealant installation: Section 07 92 00, JOINT SEALANTS.
E. Color and texture of masonry units: Match existing adjacent face brick.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
B. Samples:
   1. Provide a face brick, sample panel fabricated to no less than 16” tall by 24” wide) showing full color range and texture of bricks, bond, and proposed mortar joints.
   2. Anchors, and ties, one each and joint reinforcing (24 inches) long.
C. Certificates:
   1. Certificates signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.
   2. Indicating that the following items meet specification requirements:
      a. Face brick.
   3. Testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.
D. Manufacturer's Literature and Data.

1.4 SAMPLE PANEL

A. Before starting masonry, lay up a sample panel in accordance with Masonry Standards Joint Committee (MSJC) and Brick Industry Association (BIA).
   1. Use masonry units randomly chosen from the brick cube delivered to site.
   2. Include reinforcing, ties, and anchors, through wall flashing, weep holes, metal stud and sheathing and insulation back-up with veneer ties, typical sealant joint.

B. Use sample panels approved by Resident Engineer for standard of workmanship of new masonry work.

C. Use sample panel to test cleaning methods.

1.5 WARRANTY

Warrant exterior masonry walls against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be five years.

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):

A951-06.....Steel Wire for Masonry Joint Reinforcement.

A615/A615M-09.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

A675/A675M-03(R2009)....Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical PropertiesC34-03 Structural Clay Load-Bearing Wall Tile

C55-09.....Concrete Building Brick

C62-0.....Building Brick (Solid Masonry Units Made From Clay or Shale)

C67-09.....Sampling and Testing Brick and Structural Clay Tile

C90-11.....Load-Bearing Concrete Masonry Units

C126-10.....Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units

C216-10.....Facing Brick (Solid Masonry Units Made From Clay or Shale)

C476-10.....Standard Specification for Grout for Masonry

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

D1056-07.....Flexible Cellular Materials - Sponge or Expanded Rubber

D2000-08.....Rubber Products in Automotive Applications

D2240-05(R2010).....Rubber Property - Durometer Hardness

F1667-11.....Fasteners: Nails, Spikes and Staples

C. Masonry Industry Council:

Hot and Cold Weather Masonry Construction Manual-98 (R2000).

D. American Welding Society (AWS):

D1.4-11 Structural Welding Code – Reinforcing Steel.

E. Federal Specifications (FS):

FF-S-107C-00.....Screws, Tapping and Drive

F. Brick Industry Association - Technical Notes on Brick Construction (BIA):

11-2001.....Guide Specifications for Brick Masonry, Part I

11A-1988.....Guide Specifications for Brick Masonry, Part II

11B-1988.....Guide Specifications for Brick Masonry, Part III Execution

11C-1998.....Guide Specification for Brick Masonry Engineered Brick Masonry, Part IV

11D-1988.....Guide Specifications for Brick Masonry Engineered Brick Masonry, Part IV continued

G. Masonry Standards Joint Committee; Specifications for Masonry Structures TMS 602-08/ACI 530.1-08/ASCE 6-08 (2008 MSJC Book Version TMS-0402-08).

PART 2 - PRODUCTS

2.1 BRICK

A. Face Brick:

1. ASTM C216, Grade SW, Type FBS.
2. Brick when tested in accordance with ASTM C67: Classified slightly efflorescent or better.
3. Size:
   a. Match existing
3. Color:
   a. Match existing

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

2.2 CONCRETE MASONRY UNITS

A. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.

1. Unit Weight: Light Weight
2. Fire rated units for fire rated partitions.
3. Sizes: Modular.

B. Concrete Brick: ASTM C55.

B. Shop-fabricate reinforcement bars which are shown to be bent or hooked.

2.4 ANCHORS, TIES, AND REINFORCEMENT

A. Steel Reinforcing Bars: ASTM A615M, deformed bars, grade as shown.

B. Joint Reinforcement:

1. Form from wire complying with ASTM A951.

2. Galvanized after fabrication.
3. Width of joint reinforcement 40 mm (0.16 inches) less than nominal width of masonry wall or partition.
4. Cross wires welded to longitudinal wires.
5. Joint reinforcement at least 3000 mm (10 feet) in length.
6. Joint reinforcement in rolls is not acceptable.
7. Joint reinforcement that is crimped to form drip is not acceptable.
8. Maximum spacing of cross wires 400 mm (16 inch) to longitudinal wires.
9. Ladder Design:
   a. Longitudinal wires deformed 5 mm (0.20 inch) diameter wire.
   b. Cross wires 4 mm (0.16 inch) diameter.
10. Trussed Design:
    a. Longitudinal wires 5 mm (0.20 inch) and cross wires not less than 4 mm (0.16 inch nominal) diameter.
    b. Longitudinal wires deformed.
11. Multiple Wythes and Cavity wall ties:
    a. Longitudinal wires 4 mm (0.16 inch), two in each wythe with ladder truss wires 4 mm (0.16 inch) overlay, welded to each longitudinal wire.
    b. Longitudinal wires 4 mm (0.16 inch) with U shape 4 mm (0.16 inch) rectangular ties extending into other wythe not less than 75 mm (3 inches) spaced 400 mm o.c. (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches min.).

C. Adjustable Veneer Anchor for Frame Walls:
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:
   b. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
   c. Hot-dip galvanize all items after fabrication

Two piece, adjustable anchor and tie.

4. Angle Type:
   a. Anchor: Minimum 2.65 mm (12 gage) thick galvanized steel angle shaped anchor strap with strengthing ribs. Provide holes in vertical leg for fastener for attachment to framing with 2 screws. Provide holes near end of outstanding leg to suit upstanding portion of tie. Outstanding leg length to extend beyond cavity

wall insulation. Provide insulation retaining washer on all anchors.

b. Tie: Fabricate from 5 mm (0.20 inch) diameter galvanized cold drawn steel wire, triangular or rectangular shape with 2 legs to engage anchor. Length as required to achieve not less than 50 mm (2 inches) embedment into the bed joint of the masonry veneer and provide upstanding legs to fit through hole in anchor and be long enough to allow 50 mm (2 inches) of vertical adjustment.

H. Adjustable Steel Column Anchor:

1. Two piece anchor consisting of a 6 mm (1/4 inch) diameter steel rod to be welded to steel with offset ends, rod to permit 100 mm (4 inch) vertical adjustment of wire anchor.
2. Triangular shaped wire anchor 100 mm (4 inches) wide formed from 5 (3/16 inch) diameter galvanized wire, to extend at least 75 mm (3 inches) into joints of masonry.

I. Adjustable Steel Beam Anchor:

1. Z or C type steel strap, 30 mm (1 1/4 inches) wide, 3 mm (1/8 inch) thick.
2. Flange hook not less than 38 mm (1 1/2 inches) long.
3. Length to embed in masonry not less than 50 mm (2 inches) in 100 mm (4 inch) nominal thick masonry and 100 mm (4 inches) in thicker masonry.
4. Bend masonry end not less than 40 mm (1 1/2 inches).

2.5 PREFORMED COMPRESSIBLE JOINT FILLER

A. Thickness and depth to fill the joint as specified.

B. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1, B2F1.

C. Non-Combustible Type: ASTM C612, Class 5, 1800 degrees F.

2.6 ACCESSORIES

A. Weep Hole Wicks: Glass fiber ropes, 10 mm (3/8 inch) minimum diameter, 300 mm (12 inches) long.

B. Masonry Cleaner:

1. Detergent type cleaner selected for each type masonry used.
2. Acid cleaners are not acceptable.
3. Use soapless type specially prepared for cleaning brick or concrete masonry as appropriate.

C. Fasteners:

3. Screws: FS-FF-S-107, Type A, AB, SF thread forming or cutting.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Protection:

1. Cover tops of walls with nonstaining waterproof covering, when work is not in progress. Secure to prevent wind blow off.
2. On new work protect base of wall from mud, dirt, mortar droppings, and other materials that will stain face, until final landscaping or other site work is completed.

B. Cold Weather Protection:
1. Masonry may be laid in freezing weather when methods of protection are utilized.
2. Comply with MSJC and "Hot and Cold Weather Masonry Construction Manual".

3.2 CONSTRUCTION TOLERANCES

A. Lay masonry units plumb, level and true to line within the tolerances as per MSJC requirements and as follows:

B. Maximum variation from plumb:
1. In 3000 mm (10 feet) - 6 mm (1/4 inch).
2. In 6000 mm (20 feet) - 10 mm (3/8 inch).
3. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).

C. Maximum variation from level:
1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 inch).
2. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).

D. Maximum variation from linear building lines:
1. In any bay or up to 6000 mm (20 feet) - 13 mm (1/2 inch).
2. In 12 000 mm (40 feet) or more - 19 mm (3/4 inch).

E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
1. Minus 6 mm (1/4 inch).
2. Plus 13 mm (1/2 inch).

F. Maximum variation in prepared opening dimensions:
1. Accurate to minus 0 mm (0 inch).
2. Plus 6 mm (1/4 inch).

3.3 INSTALLATION GENERAL

A. Keep finish work free from mortar smears or spatters, and leave neat and clean.

B. Anchor masonry as specified in Paragraph, ANCHORAGE.

C. Wall Openings:
1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
2. If items are not available when walls are built, prepare openings for subsequent installation.

D. Tooling Joints:

1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
2. Tool while mortar is soft enough to be compressed into joints and not raked out.
3. Finish joints in exterior face masonry work with a jointing tool, and provide smooth, water-tight concave joint unless specified otherwise. Tool joints to match existing adjacent construction.
4. Tool Exposed interior joints in finish work concave unless specified otherwise.

E. Lintels:
1. Provide lintels as indicated but not less than hot-dipped galvanized steel angle 3 ½ inches by 3 ½ inches by 5/16 inch thick (before galvanizing).
3. Precast lintels of 25 Mpa (3000 psi) concrete, of same thickness as partition, and with one Number 5 deformed bar top and bottom for each 100 mm (4 inches) of nominal thickness, may be used in lieu of reinforced CMU masonry lintels.
6. Length for minimum bearing of 100 mm (4 inches) at ends.

F. Wall, Furring, and Partition Units:
1. Lay out field units to provide for running bond of walls and partitions, with vertical joints in second course centering on first course units unless specified otherwise.
2. Align head joints of alternate vertical courses.
3. At sides of openings, balance head joints in each course on vertical center lines of openings.
4. Use no piece shorter than 100 mm (4 inches) long.
5. On interior partitions provide a 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, concrete work, and abutting masonry partitions.
6. Use not less than 100 mm (4 inches) nominal thick masonry for free standing furring unless shown otherwise.
7. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.

G. Before connecting new masonry with previously laid, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.

H. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.

I. Chases:

1. Do not install chases in masonry walls and partitions exposed to view in finished work, including painted or coated finishes on masonry.
2. Masonry 100 mm (4 inch) nominal thick may have electrical conduits 25 mm (1 inch) or less in diameter when covered with soaps, or other finishes.
3. Full recess chases after installation of conduit, with mortar and finish flush.
4. When pipes or conduits, or both occur in hollow masonry unit partitions retain at least one web of the hollow masonry units.

J. Wetting and Wetting Test:
1. Test and wet brick or clay tile in accordance with BIA 11B.
2. Do not wet concrete masonry units before laying.

3.4 ANCHORAGE

A. Veneer to Frame Walls:
1. Use adjustable veneer anchors.
2. Fasten anchor to stud through sheathing with self drilling and tapping screws, provide 2 screws per anchor.
3. Space anchors not more than 400 mm (16 inches) on center vertically at each stud.

D. Anchorage of Abutting Masonry:
1. Anchor interior 100 mm (4 inch) thick masonry partitions to exterior masonry walls with wall ties. Space ties at 600 mm (2 foot) maximum vertical intervals. Extend ties 100 mm (4 inches) minimum into masonry.
2. Anchor interior masonry bearing walls or interior masonry partitions over 100 mm (4 inches) thick to masonry walls with rigid wall anchors spaced at 400 mm (16 inch) maximum vertical intervals.

F. Anchorage to Steel Beams or Columns:
1. Use adjustable beam anchors on each flange.
2. At columns weld the 6 mm (1/4 inch) steel rod to steel columns at 300 mm (12 inch) intervals, and place wire ties in masonry courses at 400 mm (16 inches) maximum vertically.

3.5 REINFORCEMENT

A. Joint Reinforcement:
1. Use as joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
2. Reinforcing may be used in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.

4. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
5. Additional joint reinforcement is required in mortar joints at both 200 mm (8 inches) and 400 (16 inches) above and below windows, doors, louvers and similar openings in masonry, except where other type anchors are required.

3.9 BRICKWORK

A. Lay clay brick in accordance with BIA Technical Note 11 series.
B. Laying:
   1. Match bond of existing building on alterations and additions.
   2. Maintain bond pattern throughout.
   3. Do not use brick smaller than half-brick at any angle, corner, break or jamb.
   4. Where length of cut brick is greater than one half but less than a whole brick, maintain the vertical joint location of such units.
   5. Lay exposed brickwork joints symmetrical about center lines of openings.
   6. Do not structural bond multi wythe brick walls unless shown.
   7. Before starting work, lay facing brick on foundation wall and adjust bond to openings, angles, and corners.
   9. Build solid brickwork as required for anchorage of items.
C. Joints:
   1. Match existing coursing and joint pattern and thicknesses unless otherwise indicated.
D. Weep Holes:
   1. Install weep holes at 600 mm (24 inches) on center in bottom of vertical joints of exterior masonry veneer or cavity wall facing over foundations, bond beams, and other water stops in the wall.
   2. Form weep holes using wicks made of mineral fiber insulation strips turned up 200 mm (8 inches) in cavity. Anchor top of strip to backup to securely hold in place.
   3. Install sand or pea gravel in cavity approximately 75 mm (3 inches) high between weep holes or open weave polyester mesh drainage system.
F. Cavity Type Exterior Walls:
   5. Veneer Framed Walls:
      b. Keep air space clean of mortar accumulations and debris.

3.10 CONCRETE MASONRY UNITS

A. Kind and Users:
   1. Provide special concrete masonry shapes as required, // including lintel and bond beam units, sash units, and corner units //. Use

solid concrete masonry units, where full units cannot be used, or where needed for anchorage of accessories.

2. Provide solid load-bearing concrete masonry units or grout the cell of hollow units at jambs of openings in walls, where structural members impose loads directly on concrete masonry, and where shown.
3. Provide rounded corner (bullnose) shapes at opening jambs in exposed work and at exterior corners.
4. Do not use brick jambs in exposed finish work.
5. Use concrete building brick only as filler in backup material where not exposed.
6. Masonry assemblies shall meet the required fire resistance in fire rated partitions of type and construction that will provide fire rating as shown.

B. Laying:

1. Lay concrete masonry units with 10 mm (3/8 inch) joints, with a bond overlap of not less than 1/4 of the unit length.
2. Do not wet concrete masonry units before laying.
3. Bond external corners of partitions by overlapping alternate courses.
4. Lay first course in a full mortar bed.
5. Set anchorage items as work progress.
6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill such voids with mortar or grout.
8. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
9. Lay concrete masonry units so that cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar. Unobstructed core openings not less than 50 mm (2 inches) by 75 mm (3 inches).
12. Steel reinforcement, at time of placement, free of loose flaky rust, mud, oil, or other coatings that will destroy or reduce bond.
14. Minimum clear distance between parallel bars: One bar diameter.
15. Hold vertical steel reinforcement in place by centering clips, caging devices, tie wire, or other approved methods, vertically at spacings noted.
16. Support vertical bars near each end and at intermediate intervals not exceeding 192 bar diameters.
17. Reinforcement shall be fully encased by grout or concrete.

18. Splice reinforcement or attach reinforcement to dowels by placing in contact and secured or by placing the reinforcement within 1/5 of the required bar splice length.
19. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
20. Grout cells of concrete masonry units, containing the reinforcing bars, solid as specified under grouting.
21. Place cavity and joint horizontal reinforcement as the masonry work progresses.

3.13 GROUTING

A. Preparation:
   1. Clean grout space of mortar droppings before placing grout.
   2. Close cleanouts.
   3. Install vertical solid masonry dams across grout space for full height of wall at intervals of not more than 9000 mm (30 feet). Do not bond dam units into wythes as masonry headers.
   4. Verify reinforcing bars are in cells of units or between wythes as shown.

B. Placing:
   1. Place grout by hand bucket, concrete hopper, or grout pump.
   2. Consolidate each lift of grout after free water has disappeared but before plasticity is lost.
   3. Do not slush with mortar or use mortar with grout.
   4. Interruptions:
      a. When grouting must be stopped for more than an hour, top off grout 40 mm (1-1/2 inch) below top of last masonry course.
      b. Grout from dam to dam on high lift method.
      c. A longitudinal run of masonry may be stopped off only by raking back one-half a masonry unit length in each course and stopping grout 100 mm (4 inches) back of rake on low lift method.

E. High Lift Method:
   1. Do not pour grout until masonry wall has properly cured a minimum of 4 hours.
   2. Place grout in lifts not exceeding 1.5 m (5 ft).
   3. Exception:
      Where the following conditions are met, place grout in lifts not exceeding 3.86 m (12.67 ft).
      a. The masonry has cured for at least 4 hours.
      b. The grout slump is maintained between 254 and 279 mm (10 and 11 in).

c. No intermediate reinforced bond beams are placed between the top and the bottom of the pour height.

4. When vibrating succeeding lifts, extend vibrator 300 to 450 mm (12 to 18 inches) into the preceding lift to close any shrinkage cracks or separation from the masonry units.

3.14 PLACING REINFORCEMENT

A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on the Contract Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 25 mm (1 inch), whichever is greater.

D. Splice reinforcement bars where shown; do not splice at other places unless accepted by the Resident Engineer. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

E. Provide not less than minimum lap as indicated on shop drawings, or if not indicated, as required by governing code.

G. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations.

H. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations. Lap joint reinforcement not less than 150 mm (6 inches) at ends. Use prefabricated “L” and “T” sections to provide continuity at corners and intersections. Cut and bend joint reinforcement as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

I. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.

3.17 CLEANING AND REPAIR

A. General:

1. Clean exposed masonry surfaces on completion.
2. Protect adjoining construction materials and landscaping during cleaning operations.

3. Cut out defective exposed new joints to depth of approximately 19 mm (3/4 inch) and repoint.
4. Remove mortar droppings and other foreign substances from wall surfaces.

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

C. Concrete Masonry Units:
1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
2. Allow mud to dry before brushing.

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:

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

1.2 RELATED WORK:

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

C. Gypsum board assemblies: Section 09 29 00, GYPSUM BOARD.

1.3 DESIGN REQUIREMENTS:

A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.

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

1. Design Loads: As indicated.

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

a. Exterior Non-load-Bearing Curtain wall: Lateral deflection of ~~//~~

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 67 degrees C (120 degrees F).

4. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.

5. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.

6. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

1.4 SUBMITTALS:

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

B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.

C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

D. For cold-formed metal framing indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for its preparation.

1.5 APPLICABLE PUBLICATIONS:

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

B. American Iron and Steel Institute (AISI):

Specification and Commentary for the Design of Cold-Formed Steel Structural Members (1996)

C. American Society of Testing and Materials (ASTM):

A36/A36M-08.....Standard Specifications for Carbon Structural Steel

A123/A123M-09.....Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153/A153M-09.....Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A307-10.....Standard Specifications for Carbon Steel Bolts and Studs

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

C1107/C1107M-08.....Standard Specifications for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

E488-96(R2003).....Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

E1190-95(R2007).....Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

D. American Welding Society (AWS):

D1.3/D1.3M-08.....Structural Welding Code-Sheet Steel

E. Military Specifications (Mil. Spec.):

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

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Sheet Steel for joists, studs and accessories 16 gage and heavier: ASTM A653, structural steel, zinc coated G60 with a yield of 340 MPa (50 ksi) minimum.

B. Sheet Steel for joists, studs and accessories 18 gage and lighter: ASTM A653, structural steel, zinc coated G60, with a yield of 230 MPa (33 ksi) minimum.

C. Galvanizing Repair Paint: MIL-P-21035B.

D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

2.2 WALL FRAMING:

A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:

1. Design Uncoated-Steel Thickness:

   1.52 mm (0.0598 inch

   2.66 mm (0.1046 inch

2. Flange Width:

   1-5/8 inches

   3. Web: Punched

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

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

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

2.4 FRAMING ACCESSORIES:

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

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

1. Supplementary framing.

2. Bracing, bridging, and solid blocking.

3. Web stiffeners.

4. Gusset plates.

5. Deflection track and vertical slide clips.

6. Stud kickers and girts.

7. Reinforcement plates.

2.5 ANCHORS, CLIPS, AND FASTENERS:

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

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

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer’s standard elsewhere.

2.6 REQUIREMENTS:

A. Welding in accordance with AWS D1.3

B. Furnish members and accessories by one manufacturer only.

PART 3 - EXECUTION

3.1 FABRICATION:

A. Framing components may be preassembled into panels. Panels shall be square with components attached.

B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.

C. Hold members in place until fastened.

D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer’s instructions with screw penetrating joined members by not less than 3 exposed screw threads.

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

3.2 ERECTION:

A. Handle and lift prefabricated panels in a manner as to not distort any member.

B. Securely anchor tracks to supports as shown.

C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.

D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.

E. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.

F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.

G. Install headers in all openings that are larger than the stud spacing in that wall.

H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.

I. Studs in one piece for their entire length, splices will not be permitted.

J. Provide a load distribution member at top track where joist is not located directly over bearing stud.

K. Provide joist bridging and web stiffeners at reaction points where shown.

L. Provide end blocking where joist ends are not restrained from rotation.

M. Provide an additional joist under parallel partitions, unless otherwise shown, when partition length exceeds one-half joist span and when floor and roof openings interrupt one or more spanning members.

N. Provide temporary bracing and leave in place until framing is permanently stabilized.

O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.

P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.3 TOLERANCES:

A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.

B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.

C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.

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

3.4 FIELD REPAIR:

Touch-up damaged galvanizing with galvanizing repair paint.

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SECTION 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. Loose Lintels
3. Plate Door Sill

1.2 RELATED WORK

A. Prime and finish painting: Section 09 91 00, PAINTING.

B. Stainless steel corner guards: Section 10 26 00, WALL AND DOOR PROTECTION.

1.3 SUBMITTALS

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

B. Shop Drawings:

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

C. Manufacturer's Certificates:

1. Anodized finish as specified.
2. Live load designs as specified.

D. Design Calculations for specified live loads including dead loads.

E. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.4 QUALITY ASSURANCE

A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.

B. Each product type shall be the same and be made by the same manufacturer.

C. Assembled product to the greatest extent possible before delivery to the site.

D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.5 APPLICABLE PUBLICATIONS

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

B. American Society of Mechanical Engineers (ASME):
B18.6.1-97.....Wood Screws
B18.2.2-87(R2005).....Square and Hex Nuts

C. American Society for Testing and Materials (ASTM):
A36/A36M-08.....Structural Steel
A47-99(R2009).....Malleable Iron Castings
A48-03(R2008).....Gray Iron Castings
A53-10.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A123-09.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
A269-10.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service
A307-10.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
A312/A312M-09.....Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
A391/A391M-07.....Grade 80 Alloy Steel Chain
A653/A653M-10.....Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
A786/A786M-09.....Rolled Steel Floor Plate
B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
B456-03(R2009).....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
B632-08.....Aluminum-Alloy Rolled Tread Plate
C1107-08.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
D3656-07.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
F436-10.....Hardened Steel Washers

F468-10.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
F593-02(R2008).....Stainless Steel Bolts, Hex Cap Screws, and Studs
F1667-11.....Driven Fasteners: Nails, Spikes and Staples

D. American Welding Society (AWS):
D1.1-10.....Structural Welding Code Steel
D1.2-08.....Structural Welding Code Aluminum
D1.3-08.....Structural Welding Code Sheet Steel

E. National Association of Architectural Metal Manufacturers (NAAMM)
AMP 521-01.....Pipe Railing Manual
AMP 500-06.....Metal Finishes Manual
MBG 531-09.....Metal Bar Grating Manual
MBG 532-09.....Heavy Duty Metal Bar Grating Manual

F. Structural Steel Painting Council (SSPC)/Society of Protective Coatings:
SP 1-04.....No. 1, Solvent Cleaning
SP 2-04.....No. 2, Hand Tool Cleaning
SP 3-04.....No. 3, Power Tool Cleaning

G. Federal Specifications (Fed. Spec):
RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel: ASTM A36.
B. Floor Plate:
1. Steel ASTM A786.
C. Steel Pipe: ASTM A53.
1. Galvanized for exterior locations.
2. Type S, Grade A unless specified otherwise.
3. NPS (inside diameter) as shown.
D. Cast-Iron: ASTM A48, Class 30, commercial pattern.
E. Malleable Iron Castings: A47.
F. Primer Paint: As specified in Section 09 91 00, PAINTING.

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 fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship
1. General:
   a. Fabricate items to design shown.
   b. Furnish members in longest lengths commercially available within the limits shown and specified.
   c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
   d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
   e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
   f. Prepare members for the installation and fitting of hardware.
   g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
   h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
   a. Weld in accordance with AWS.
   b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
   c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
   d. Finish welded joints to match finish of adjacent surface.
3. Joining:

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

4. Anchors:
   a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
   b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
   a. Accurately cut, machine and fit joints, corners, copes, and miters.
   b. Fit removable members to be easily removed.
   c. Design and construct field connections in the most practical place for appearance and ease of installation.
   d. Fit pieces together as required.
   e. Fabricate connections for ease of assembly and disassembly without use of special tools.
   f. Joints firm when assembled.
   g. Conceal joining, fitting and welding on exposed work as far as practical.
   h. Do not show rivets and screws prominently on the exposed face.
   i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:
1. 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.

G. Protection:

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

2.5 SUPPORTS

A. General:

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

B. For Wall Mounted Items:

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

C. Steel Frames:

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

2.6 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.

E. Provide bearing plates for lintels where shown.

F. Weld or bolt upstanding legs of double angle lintels together with 19 mm (3/4 inch bolts) spaced at 300 mm (12 inches) on centers.

G. Insert spreaders at bolt points to separate the angles for insertion of metal windows, louver, and other anchorage.

H. Where shown or specified, punch upstanding legs of single lintels to suit size and spacing of anchor bolts.

2.7 PLATE DOOR SILL

A. Fabricate of checkered plate as detailed.
   1. Aluminum Plate: ASTM B632, 3 mm (0.125 inch) thick.
   2. Steel Plate: ASTM A786, 3 mm (0.125 inch thick), galvanized G90.

B. Fabricate for anchorage with flat head countersunk bolts at each end and not over 300 mm (12 inches), o.c.

2.8 RAILINGS

A. In addition to the dead load, design railing assembly to support live load specified.

B. Fabrication General:
   1. Provide continuous welded joints, dressed smooth and flush.
   2. Standard flush fittings, designed to be welded, may be used.
   3. Exposed threads will not be approved.
   4. Form handrail brackets to size and design shown.
   5. Exterior Post Anchors.
      a. Fabricate tube or pipe sleeves with closed ends or plates as shown.
      b. Where inserts interfere with reinforcing bars, provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.
      c. Provide heavy pattern sliding flange base plate with set screws at base of pipe or tube posts.
      d. Weld or thread flanged fitting to posts at base.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Items set into concrete or masonry.
   1. Provide temporary bracing for such items until concrete or masonry is set.
   2. Place in accordance with setting drawings and instructions.
   3. Build strap anchors, into masonry as work progresses.

C. Field weld in accordance with AWS.
   1. Design and finish as specified for shop welding.
   2. Use continuous weld unless specified otherwise.

D. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified.

E. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.

F. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

A. Anchorage to structure.
   1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
   2. Secure supports to concrete inserts by bolting or continuous welding as shown.
   3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
   4. Secure steel plate or hat channels to studs as detailed.

B. Supports for Wall Mounted items:
   1. Locate center of support at anchorage point of supported item.
   2. Locate support at top and bottom of wall hung cabinets.
   3. Locate support at top of floor cabinets and shelving installed against walls.
   4. Locate supports where required for items shown.

3.3 OTHER FRAMES

A. Set frame flush with surface unless shown otherwise.

B. Anchor frames at ends and not over 450 mm (18 inches) on centers unless shown otherwise.

C. Set in formwork before concrete is placed.

3.4 STEEL LINTELS

A. Use lintel sizes and combinations shown or specified.

B. Install lintels with longest leg vertical.

C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

3.5 PLATE DOOR SILL

A. Install after roofing base flashing and counter flashing work is completed.

B. Set in sealant and bolt to curb.

3.6 RAILINGS

Bolt railing post bases to concrete deck with expansion shields or as otherwise shown on the Drawings.

3.7 STEEL COMPONENTS FOR MILLWORK ITEMS

Coordinate and deliver to Millwork fabricator for assembly where millwork items are secured to metal fabrications.

3.8 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, sheathing, furring, nailers, and rough hardware.

1.2 RELATED WORK:

B. Membrane Roofing: Section 07 54 23: THERMOPLASTIC POLYOLEFIN ROOFING.

1.3 SUMBITTALS:

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

B. Metal studs, Section 05 40 00, COLD-FORMED METAL FRAMING

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 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. Treat wood members and plywood exposed to weather or in contact with masonry or concrete, including sole plates, furring, and sleepers

that are less than 600 mm (24 inches) from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members used in connection with roofing and flashing materials.

2. Treat other members specified as preservative treated (PT).
3. Preservative treat by the pressure method complying with ASTM D1760, except any process involving the use of Chromated Copper arsenate (CCA) for pressure treating wood is not permitted.

2.2 PLYWOOD

A. Comply with Prod. Std., PS 1.
B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type.
C. Sheathing:
   1. APA rated Exposure 1 or Exterior; panel grade CD or better.
   2. Wall sheathing:
      a. Thickness to match existing with supports 400 mm (16 inches) on center and 12 mm (15/32 inch) thick with supports 600 mm (24 inches) on center unless specified otherwise.

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.

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.

PART 3 - EXECUTION

3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

A. Conform to applicable requirements of the following:

1. AFPA National Design Specification for Wood Construction for timber connectors.
2. AITC Timber Construction Manual for heavy timber construction.
3. AFPA WCD-number 1, Manual for House Framing for nailing and framing unless specified otherwise.
4. APA for installation of plywood or structural use panels.
5. ASTM F 499 for wood underlayment.
6. TPI for metal plate connected wood trusses.

B. Fasteners:

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

e. 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 one at ends of nailer and 600 mm (24 inch) intervals between end bolts. Use clips to beam flanges.
3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.
   a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
   b. ASTM C 954 for steel over 0.84 mm (0.033 inch) thick.
4. Power actuated drive pins may be used where practical to anchor to solid masonry, concrete, or steel.
5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Use metal plugs, inserts or similar fastening.
6. Screws to join wood:
   a. Use screws to attach plywood to metal framing.
   b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
   c. Spaced same as nails.
7. Installation of Timber Connectors:
   a. Conform to applicable requirements of the NFPA National Design Specification for Wood Construction.
   b. Fit wood to connectors and drill holes for fasteners so wood is not split.

C. Set sills or plates level in full bed of mortar on masonry or concrete walls.
   1. Space anchor bolts 1200 mm (4 feet) on centers between ends and within 150 mm (6 inches) of end. Stagger bolts from side to side on plates over 175 mm (7 inches) in width.
   2. Use shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
   3. Closely fit, and set to required lines.

D. 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.

E. 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.

F. Sheathing:
   1. Use plywood or structural-use panels for sheathing.
   2. Lay panels with joints staggered, with edge and ends 3 mm (1/8 inch) apart and nailed over bearings as specified.
   3. Set fasteners not less than 9 mm (3/8 inch) from edges.
   4. Install 50 mm by 100 mm (2 inch by 4 inch) blocking spiked between joists, rafters and studs to support edge or end joints of panels.
   5. Match and align sheathing which is an extension of work in place to existing.

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SECTION 06 20 00
FINISH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies exterior and interior millwork.

B. Items specified.

- Mounting Strips, Shelves, and Rods
- Wall Paneling

1.2 RELATED WORK

A. Fabricated Metal brackets, bench supports and countertop legs: Section 05 50 00, METAL FABRICATIONS.

B. Framing, furring and blocking: Section 06 10 00, ROUGH CARPENTRY.

C. Wood doors: Section 08 14 00, WOOD DOORS.

E. Stock Casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.

D. Color and texture of finish: See Finish Schedule on Drawings.

1.3 SUBMITTALS

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

B. Shop Drawings:

1. Millwork items – Half full size scale for sections and details 1:50 (1/4-inch) for elevations and plans.
2. Show construction and installation.

C. Samples:

Plastic laminate finished plywood or particleboard, 150 mm by 300 mm (six by twelve inches).

D. Certificates:

1. Indicating moisture content of materials meet the requirements specified.

E. Manufacturer's literature and data:

1. Finish hardware
2. 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^{0}C (70^{0}F) for not less than 10 days before installation.

C. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

1.5 APPLICABLE PUBLICATIONS

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

B. American Society of Testing and Materials (ASTM):
A36/A36M-08.....Structural Steel
A53-07.....Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
A167-99 (R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
B26/B26M-09.....Aluminum-Alloy Sand Castings
B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
E84-09.....Surface Burning Characteristics of Building Materials

C. American Hardboard Association (AHA):
A135.4-04.....Basic Hardboard

D. Builders Hardware Manufacturers Association (BHMA):
A156.9-03.....Cabinet Hardware
A156.11-04.....Cabinet Locks
A156.16-02.....Auxiliary Hardware

E. Hardwood Plywood and Veneer Association (HPVA):
HP1-09.....Hardwood and Decorative Plywood

F. National Particleboard Association (NPA):
A208.1-99.....Wood Particleboard

G. American Wood-Preservers' Association (AWPA):
AWPA C1-03.....All Timber Products – Preservative Treatment by Pressure Processes

H. Architectural Woodwork Institute (AWI):
AWI-99.....Architectural Woodwork Quality Standards and Quality Certification Program

I. National Electrical Manufacturers Association (NEMA):
LD 3-05.....High-Pressure Decorative Laminates

J. U.S. Department of Commerce, Product Standard (PS):
PS20-05.....American Softwood Lumber Standard

K. Military Specification (Mil. Spec):
MIL-L-19140E.....Lumber and Plywood, Fire-Retardant Treated

L. Federal Specifications (Fed. Spec.):
A-A-1922A.....Shield Expansion
A-A-1936.....Contact Adhesive

FF-N-836D.....Nut, Square, Hexagon Cap, Slotted, Castle

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

MM-L-736(C).....Lumber, Hardwood

PART 2 - PRODUCTS

2.1 LUMBER

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

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

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

D. Softwood: PS-20, exposed to view appearance grades:
   1. Use C select or D select, vertical grain for transparent finish including stain transparent finish.
   2. Use Prime for painted or opaque finish.

E. Use edge grain Wood members exposed to weather.

2.2 PLYWOOD

A. Softwood Plywood:
   1. Prod. Std.
   2. Grading and Marking:
      a. Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood.
      b. The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PS1.
   3. Plywood, 13 mm (1/2 inch) and thicker; not less than five ply construction, except 32 mm (1-1/4 inch) thick plywood not less than seven ply.

5. Shelving Plywood:
   a. Interior Type, any species group.
   b. Veneer Grade: A-B or B-C.
6. Other: As specified for item.

B. Medium Density Fiberboard (MDF):
1. Comply with ANSI A 208.2-2009 Grade 15.
2. Provide thickness(s) and type(s) as shown on the Drawings.
3. Basis-of-Design: "Medite II", no formaldehyde MDF with Superior Properties:
   a. Manufacturer: Sierra Pine Composite
      1050 Melody Lane, Suite 160
      Roseville, CA 95678
      www.sierrapine.com
   b.

Properties	Imperial	Metric
Density	4716/ft3	753kg/m3
Internal Bond	170lb/in2	1.17N/mm2
Modulus of Rupture	5000lb/in2	34.45N/mm2
Modulus of Elasticity	550,000lb/in2	3790N/mm2
Screw Holding (face)	300lb.	1334N
Screw Holding (edge)	250lb.	1110N
Thickness tolerance	0.005"	0.127mm
Thickness swell	3.5%	
Linear Expansion	0.27%	
Water Absorption	6.5%	
Flamespread	Class 3 (c)	
Moisture Content	4-6%	
Formaldehyde	0.01 ppm	

2.4 ADHESIVE

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

2.5 STAINLESS STEEL

ASTM A167, Type 302 or 304.

2.6 ALUMINUM CAST

ASTM B26

2.7 ALUMINUM EXTRUDED

ASTM B221

2.9 HARDWARE

A. Rough Hardware:

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

B. Finish Hardware

1. Primers: Manufacturer's standard primer for steel providing baked enamel finish.

2.10 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.
3. Moisture content of other materials shall be in accordance with the standards under which the products are produced.

2.11 PRESERVATIVE TREATMENT

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

B. Use Grade A, exterior plywood for treatment.

2.12 FABRICATION

A. General:

1. Except as otherwise specified, use AWI Custom Grade for architectural woodwork and interior millwork.
2. Finish woodwork shall be free from pitch pockets.
3. Except where special profiles are shown, trim shall be standard stock molding and members of the same species.
4. Plywood shall be not less than 13 mm (1/2 inch), unless otherwise shown or specified.

5. Edges of members in contact with concrete or masonry shall have a square corner caulking rebate.
6. Fabricate members less than 4 m (14 feet) in length from one piece of lumber, back channeled and molded a shown.
7. Interior trim and items of millwork to be painted may be fabricated from jointed, built-up, or laminated members, unless otherwise shown on drawings or specified.
8. Plastic Laminate Work:
   a. Factory glued to either a plywood or a particle board core, thickness as shown or specified.
   b. Cover exposed edges with plastic laminate, except where aluminum, stainless steel, or plastic molded edge strips are shown or specified. Use plastic molded edge strips on 19 mm (3/4-inch) molded thick or thinner core material.
   d. Use backing sheet on concealed large panel surface when decorative face does not occur.

C. Mounting Strips, Shelves and Rods:
1. Cut mounting strips from 25 mm by 100 mm (1 by 4 inches) softwood stock, with exposed edge slightly rounded.
2. Cut wood shelf from softwood 1 inch stock, of width shown, exposed edge slightly rounded. Option: Use 19 mm (3/4 inch) thick plywood with 19 mm (3/4 inch) softwood edge nosing on exposed edge, slightly rounded.
3. Rod or Closet Bar: L03131. Combination Garment and Shelf Support, intermediate support for closet bar for rods over 1800 mm (6 feet) long.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Maintain work areas and storage areas to a minimum temperature of 21^{0}C (70^{0}F) for not less than 10 days before and during installation of interior millwork.

B. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

3.2 INSTALLATION

A. General:
1. Millwork receiving transparent finish shall be primed and back-painted on concealed surfaces. Set no millwork until primed and back-painted.
2. Secure trim with fine finishing nails, screws, or glue as required.

3. Set nails for putty stopping. Use washers under bolt heads where no other bearing plate occurs.
4. Seal cut edges of preservative and fire retardant treated wood materials with a certified acceptable sealer.
5. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.
6. Plumb and level items unless shown otherwise.
7. Nail finish at each blocking, lookout, or other nailer and intermediate points; toggle or expansion bolt in place where nails are not suitable.

E. Wall Paneling:
1. Medium Density Fiberboard
   a. Install 25 by 75 mm (1 by 3 inch) furring strips on 400 mm (16 inch) centers horizontally between top and bottom strips. Secure to each stud with two screws.
   b. Install paneling laid vertically with end joints staggered between adjacent boards.
   c. Tightly butt joints and blind nail each board at each furring strip.
2. Install edge trim and base as shown, use solid wood members of same species as wall paneling.
3. Plywood paneling:
   a. Install 25 by 75 mm (1 by 3 inch) furring strips horizontally, under end joints of plywood and 300 mm (16 inches) on center—between end strips. Install cross furring strips centered vertically at side joints of plywood paneling less than 13 mm (1/2 inch) thick. Secure to each stud with two screws.
   b. Install panels with long edge vertically and end joints aligned—where exposed to view.
   c. Align V-grooves where end joints meet and maintain continuity of pattern.
   d. Apply adhesive to each furring strip so that panel is bonded to furring strip in continuous bead of adhesive in accordance with adhesive manufacturer’s specifications.
   e. Nailing:
      1) Nail in V-grooves to horizontal furring strips and at panel edges and within 25 mm (1 inch) of ends except within 50 mm (2 inches) of end when panel end abutts other surfaces. Do not space nails in V-groves over 150 mm (6 inches), on center.

2) Nail ungrooved panels at 400 mm (16 inches) centers to horizontal furring strips between end or edge nails. Set nails and fill hole with filler to match wood panel for panels thicker than 13 mm (1/2 inch). // Set nails flush with surface of panel thinner than 13 mm (1/2 inch). //
3) Use colored nails matching panel finish for prefinished panels or panels less than 13 mm (1/2 inch) thick.

F. Shelves:
1. Install mounting strip at back wall and end wall for shelves in closets where shown secured with toggle bolts at each end and not over 600 mm (24 inch) centers between ends.
   a. Nail Shelf to mounting strip at ends and to back wall strip at not over 900 mm (36 inches) on center.
   b. Install metal bracket, ANSI A156.16, B04041, not over 1200 mm (4 feet) centers when shelves exceed 1800 mm (6 feet) in length.
   c. Install metal bracket, ANSI A156.16, B04051, not over 1200 mm (4 feet) on centers where shelf length exceeds 1800 mm (6 feet) in length with metal rods, clothes hanger bars ANSI A156.16, L03131, of required length, full length of shelf.
2. Install vertical slotted shelf standards, ANSI A156.9, B04103 to studs with toggle bolts through each fastener opening. Double slotted shelf standards may be used where adjacent shelves terminate.
   a. Install brackets ANSI A156.9, B04113, providing supports for shelf not over 900 mm (36 inches) on center and within 13 mm (1/2 inch) of shelf end unless shown otherwise.
   b. Install shelves on brackets so front edge is restrained by bracket.

I. Install with butt joints in straight runs and miter at corners.

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SECTION 07 19 20
MOISTURE VAPOR CONTROL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies moisture vapor control system for use on concrete floors below interior floor coverings.

1.2 RELATED WORK

A. Division 9 Sections for concrete patching and leveling materials used to prepare concrete substrates for interior floor coverings.

1.3 PERFORMANCE REQUIREMENTS:

A. Moisture vapor control system shall meet performance requirements without failure from manufacturing, fabrication or installation defects.

1. Moisture vapor control system performance requirements:

a. Permeability: ASTM D1653 – 0.044 perms

b. Permeability: ASTM E96 – 0.11 perms

c. Affect of PH: Immersion in concentrated KoH with pH of 14 – no effect

d. VOC content: SCAQMO 1168 – 0g/L

2. Moisture vapor control system shall be compatible with all flooring materials, adhesives, substrate preparation materials.

3. Moisture vapor control system shall correct moisture vapor conditions of flooring substrates to within flooring manufacturer requirements for each flooring type and installation

B. Concrete slabs-on-grade and elevated slabs shall meet planarity requirements:

1. 1/8” under a 10 foot straight edge

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. All system components for products indicated

C. Shop Drawings: Plans indicating substrates, locations, and average depths of moisture vapor control system based on survey of substrate conditions.

C. Certificates: Signed by manufacturers of both moisture vapor control system and floor covering system certifying that products are compatible.

D. Installer qualifications: indicating that installer is qualified to install products

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Installer who is approved by manufacturer for application of moisture vapor control system products required for this Project.

B. Product Compatibility: Manufacturers of both moisture vapor control system and floor covering system certify in writing that products are compatible.

C. Preinstallation Conference: Conduct conference at Project site.

D. Installation of ARDEX Moisture Control System must be by a factory-trained ARDEX LevelMaster Elite Installer who has specific experience with the installation of ARDEX MC.

E. Applicator must file a pre-installation checklist with the manufacturer and receive written confirmation of the approval to proceed in order to obtain the 10 year ARDEX Moisture Control Warranty.

F. ARDEX Moisture Control System shall be installed only over concrete surfaces that have been properly mechanically prepared to a minimum surface profile of ICRI CSP #3 and which have a moisture emission level of 20 lbs. or less at the time of testing when measured in accordance with ASTM F1869, or an RH value of 95% or less when measured in accordance with ASTM F2170.

G. ARDEX Moisture Control System shall reduce the vapor emissions of the concrete to less than 3 lb. and the underlayment or topping surface shall be suitable to receive all types of floor coverings or sealers when allowed to properly dry in accordance with Ardex recommendations.

H. The device used to measure the RH of the concrete shall be the Wagner Rapid RH Probe.

1.6 DELIVERY STORAGE AND HANDLING:

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.7 PROJECT CONDITIONS:

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and

humidity, ventilation, and other conditions affecting moisture vapor control system performance.

1. Place moisture vapor control system only when ambient temperature and temperature of substrates are between 10 and 23 deg C (50 and 70 deg F).

1.8 COORDINATION:

A. Coordinate application of moisture vapor control system with requirements of floor covering products, including adhesives, specified in Division 09 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 MOISTURE VAPOR CONTROL SYSTEM:

A. Basis-Of-Design Product: Subject to compliance with requirements, provide Ardex; MC Moisture Control System or comparable product.
B. Epoxy-based moisture control: ARDEX Moisture Control.
C. Portland cement-based underlayment or topping: Ardex product suitable for the intended use.
D. Pre-smoothing very uneven substrates: ARDEX S 31 Smoothing Compound.
E. Fill dormant cracks: Epoxy material MM80 or approved equal.
F. Sand broadcast into the fresh ARDEX S-MC coat: Fine sand that is less than 1/50 of an inch in grain size or 98.5% passing sieve size #35.
G. Aggregate: Well graded, washed gravel, 1/8” to 14” or larger.
H. The device used to measure the RH of the concrete shall be the Wagner Rapid RH Probe.
I. Water: Potable and at a temperature of not more than 21 deg C (70 deg F).

2.2 MIX DESIGN:

A. Each individual unit of ARDEX P-MC Primer and ARDEX S-MC Sealer contains separate, pre-measured quantities of the hardener (Part A) and the resin (Part B). The hardening agent (Part A) is added to the resin (Part B).
B. ARDEX S 21 is mixed in 2-bag batches at one time. Mix each bag of ARDEX S 21 (50 lb.) with 5 quarts of water. Product shall be mixed in an ARDEX T-10 Mixing Drum using an ARDEX T-1 Mixing Paddle and a 1/3” heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture. Follow written instructions per the ARDEX S 21 bag label.

C. For mix designs related to the use of ARDEX underlayments and toppings, refer to the standard mixing instructions for installation over concrete as shown in the manufacturer's installation instructions.

D. For instructions on the filling of dormant cracks and joints, follow the written instructions of the selected epoxy manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through moisture vapor control system.
2. Fill substrate voids to prevent moisture vapor control system from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair moisture vapor control system bond.

1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 20 lbs. of water (9.06 kg of water) or less in 24 hours.
2. Moisture Vapor testing in accordance with ASTM F2170 shall be deemed to be at a measured relative humidity of 95% or less as measured by a relative humidity test, such as Wagner RH, at the time of installation of the ARDEX Moisture Control System.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with moisture vapor control system according to manufacturer's written instructions.

3.3 APPLICATION:

A. General: Mix and apply moisture vapor control system components according to manufacturer's written instructions.

1. Close areas to traffic during moisture vapor control system application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum moisture vapor control system -to-substrate and intercoat adhesion.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through moisture vapor control system.

B. Apply moisture vapor control system to produce uniform, level surface.
   1. Apply a final layer without aggregate to produce surface.
   2. Feather edges to match adjacent floor elevations.

C. Cure moisture vapor control system according to manufacturer's written instructions. Prevent contamination during application and curing processes.

D. Do not install floor coverings over moisture vapor control system until after time period recommended in writing by moisture vapor control system manufacturer.

E. Remove and replace moisture vapor control system areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 FIELD QUALITY CONTROL

A. Field sampling of the Ardex products is to be done by taking an entire unopened unit or bag of the product being installed to a Contractor engaged independent testing facility to perform the specified testing. No in situ test procedures for the evaluation of the materials specified shall be performed.

3.5 PROTECTION:

A. Protect moisture vapor control system from concentrated and rolling loads for remainder of construction period.

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SECTION 07 21 13
THERMAL INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies thermal and acoustical insulation for buildings.

B. Acoustical insulation is identified by thickness and words "Acoustical Insulation".

1.2 RELATED WORK

A. Insulation for insulated wall panels: Section 07 40 00, ROOFING AND SIDING PANELS.

B. Insulation in connection with roofing and waterproofing: Section 07 22 00, ROOF AND DECK INSULATION.

C. Firestopping: Section 07 81 00 APPLIED FIREST0PPING

D. Safing insulation: Section 07 84 00, FIRESTOPPING.

1.3 SUBMITTALS:

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

B. Manufacturer's Literature and Data:

1. Insulation, each type used
2. Adhesive, each type used.
3. Tape

C. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

1.4 STORAGE AND HANDLING:

A. Store insulation materials in weathertight enclosure.

B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

1.5 APPLICABLE PUBLICATIONS:

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

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

C270-08.....Mortar for Unit Masonry

C553-08.....Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

C578-08.....Rigid, Cellular Polystyrene Thermal Insulation

C591-08.....Unfaced Preformed Rigid Cellular Polyisocynurate Thermal Insulation
C612-04.....Mineral Fiber Block and Board Thermal Insulation
C954-07.....Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness
C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
D312-00(R2006).....Asphalt Used in Roofing
E84-08.....Surface Burning Characteristics of Building Materials
F1667-05.....Driven Fasteners: Nails, Spikes and Staples.

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL:

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

Material Type	Percent by Weight
Perlite composite board	23 percent post consumer recovered paper
Polyisocyanurate/polyurethane	
Rigid foam	9 percent recovered material
Foam-in-place	5 percent recovered material
Glass fiber reinforced	6 percent recovered material
Phenolic rigid foam	5 percent recovered material
Rock wool material	75 percent recovered material

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

2.2 EXTERIOR FRAMING OR FURRING INSULATION:

A. Batt or Blanket: Optional.

B. Mineral Fiber: ASTM C665, Type II, Class C, Category I where framing is faced with gypsum board.

C. Mineral Fiber: ASTM C665, Type III, Class A where framing is not faced with gypsum board.

2.3 ACOUSTICAL INSULATION:

A. Mineral Fiber boards: ASTM C553, Type II, flexible, or Type III, semirigid (4.5 pound nominal density).

B. Mineral Fiber Batt or Blankets: ASTM C665. Maximum flame spread of 25 and smoke development of 450 when tested in accordance with ASTM E84.

C. Thickness as shown; of widths and lengths to fit tight against framing.

2.4 SOUND DEADENING BOARD:

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

B. Perlite Board: ASTM C728, 13 mm (1/2 inch thick).

2.5 FASTENERS:

A. Staples or Nails: ASTM F1667, zinc-coated, size and type best suited for purpose.

B. Screws: ASTM C954 or C1002, size and length best suited for purpose with washer not less than 50 mm (two inches) in diameter.

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

2.6 ADHESIVE:

A. As recommended by the manufacturer of the insulation.

B. Asphalt: ASTM D312, Type III or IV.

C. Mortar: ASTM C270, Type 0.

2.7 TAPE:

A. Pressure sensitive adhesive on one face.

B. Perm rating of not more than 0.50.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install insulation with the vapor barrier facing the heated side, unless specified otherwise.

B. Install rigid insulating units with joints close and flush, in regular courses and with cross joints broken.

C. Install batt or blanket insulation with tight joints and filling framing void completely. Seal cuts, tears, and unlapped joints with tape.

D. Fit insulation tight against adjoining construction and penetrations, unless specified otherwise.

B. Horizontal insulation under concrete floor slab:

1. Lay insulation boards and blocks horizontally on level, compacted and drained fill.
2. Extend insulation from foundation walls towards center of building not less than 600 mm (24 inches) or as shown.

3.2 EXTERIOR FRAMING OR FURRING BLANKET INSULATION:

A. Pack insulation around door frames and windows and in building expansion joints, door soffits and other voids. Pack behind outlets around pipes, ducts, and services encased in walls. Open voids are not permitted. Hold insulation in place with pressure sensitive tape.

B. Lap vapor retarder flanges together over face of framing for continuous surface. Seal all penetrations through the insulation.

C. Fasten blanket insulation between metal studs or framing and exterior wall furring by continuous pressure sensitive tape along flanged edges.

D. Fasten blanket insulation between wood studs or framing with nails or staples through flanged edges on face of stud. Space fastenings not more than 150 mm (six inches) apart.

3.3 ACOUSTICAL INSULATION:

A. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.

B. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind outlets, around pipes, ducts, and services encased in wall or partition. Hold insulation in place with pressure sensitive tape or adhesive.

C. Do not compress insulation below required thickness except where embedded items prevent required thickness.

D. Where acoustical insulation is installed above suspended ceilings install blanket at right angles to the main runners or framing. Extend insulation over wall insulation systems not extending to structure above.

E. Where semi-rigid 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.

F. Where sound deadening board is shown, secure with adhesive to masonry or concrete walls and with screws to metal or wood framing. Secure sufficiently in place until subsequent cover is installed. Seal all cracks with caulking.

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SECTION 07 22 00
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Repairs and alteration work to existing roof insulation.

1.2 RELATED WORK

A. Wood cants, blocking, and edge strips: Section 06 10 00, ROUGH CARPENTRY.

B. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.

C. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

D. Membrane Roofing: Section 07 54 23 FULLY ADHERED TPO ROOFING

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):

90.1-07.....Energy Standard for Buildings Except Low-Rise Residential Buildings

C. ASTM International (ASTM):

C1177/C1177M-08.....Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

C1278/C1278M-07.....Standard Specification for Fiber-Reinforced Gypsum Panel

C1289-10.....Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

C1396/C1396M-09.....Standard Specification for Gypsum Board

D41-05.....Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

D312-06.....Asphalt Used in Roofing

D1970-09.....Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials

Used as Steep Roofing Underlayment for Ice Dam Protection

D2178-04.....Asphalt Glass Felt Used in Roofing and Waterproofing

D2822-05.....Asphalt Roof Cement

D4586-07.....Standard Specification for Asphalt Roof Cement, Asbestos-Free

E84-09.....Standard Test Method for Surface Burning Characteristics of Building Material

F1667-05.....Driven Fasteners: Nails, Spikes, and Staples

D. FM Approvals: RoofNav Approved Roofing Assemblies and Products.

4450-89.....Approved Standard for Class 1 Insulated Steel Deck Roofs

4470-10.....Approved Standard for Class 1 Roof Coverings

1-28-09.....Loss Prevention Data Sheet: Design Wind Loads.

1-29-09.....Loss Prevention Data Sheet: Above-Deck Roof Components

1-49-09.....Loss Prevention Data Sheet: Perimeter Flashing

E. National Roofing Contractors Association: Roofing and Waterproofing Manual

www.biopreferred.gov

F. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory (2009)

G. U.S. Department of Commerce National Institute of Standards and Technology (NIST):

DOC PS 1-09.....U.S. Product Standard for Construction and Industrial Plywood

DOC PS 2-04.....Performance Standard for Wood-Based Structural-Use Panels.

1.4 PERFORMANCE REQUIREMENTS

A. Thermal Performance: Provide roof insulation meeting minimum overall average R-value of 33, with minimum R-value at any location of 10.

B. FM Approvals: Provide roof insulation complying with requirements in FM Approvals 4450 and 4470 as part of specified roofing system, listed in FM Approvals "RoofNav" as part of roofing system meeting Fire/Windstorm Classification in Division 07 roofing section.

1.5 QUALITY CONTROL

A. Requirements of Division 07 roofing section for qualifications of roofing system insulation Installer; Work of this Section shall be performed by same Installer.

B. Requirements of Division 07 roofing section for inspection of Work of this Section and qualifications of Inspector.

C. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.

D. Requirements of roofing system uplift pressure design for specified roofing system.

E. Requirements of applicable FM Approval for specified roofing system insulation attachment.

1.6 SUBMITTALS

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

B. Product Data:

1. Asphalt and adhesive materials, each type.
2. Roofing cement, each type.
3. Roof insulation, each type.
5. Cover board, each type.
6. Fastening requirements.
7. Insulation span data for flutes of metal decks.

D. Shop Drawings: Include plans, sections, details, and attachments.

1. Nailers, cants, and terminations.
2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.

E. Samples:

1. Roof insulation, each type.
2. Nails and fasteners, each type.

F. Certificates:

1. Indicating type, thermal conductance, and minimum and average thickness of insulation.
2. Indicating materials and method of application of insulation system meet the requirements of FM Approvals for specified roofing system.

G. Laboratory Test Reports: Thermal values of insulation products.

H. Layout of tapered roof system showing units required.

I. Documentation of supervisors' and inspectors' qualifications.

1.7 DELIVERY, STORAGE AND MARKING

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

1.8 QUALITY ASSURANCE:

A. Roof insulation on combustible or steel decks shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E84, or shall have successfully passed FM Approvals 4450.
   1. Insulation bearing the UL label and listed in the UL Building Materials Directory as meeting the flame spread and smoke developed ratings will be accepted in-lieu-of copies of test reports.
   2. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof construction assembly of the particular type used for this project and the construction is listed as fire-classified in the UL Building Materials Directory or listed as Class I roof deck construction in the FM Approvals "RoofNav."
   3. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

PART 2 - PRODUCTS

2.1 ADHESIVE MATERIALS

A. Adhesive Materials, General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
   1. Liquid-type adhesive materials shall comply with VOC limits of authorities having jurisdiction.
   2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Plastic Foam Adhesives: 50 g/L.
      b. Multipurpose Construction Adhesives: 70 g/L.
      c. Fiberglass Adhesives: 80 g/L.
      d. Contact Adhesives: 80 g/L.

e. Other Adhesives: 250 g/L.

f. Non-membrane Roof Sealants: 300 g/L.

g. Sealant Primers for Nonporous Substrates: 250 g/L.

h. Sealant Primers for Porous Substrates: 775 g/L.

B. Primer: ASTM D41.

C. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.

D. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

E. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multi-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

F. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

G. Roof Cement: Asbestos free, ASTM D2822, Type I or Type II, ; or, D4586, Type I or Type II.

2.2 ROOF AND DECK INSULATION

A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

C. Cellular Glass Board Insulation: ASTM C552, Type IV, kraft-paper sheet faced.

D. Tapered Roof Insulation System:

1. Fabricate of polyisocyanurate. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
2. Cut to provide high and low points with crickets and slopes as shown.
3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
4. Minimum slope 1:48 (1/4 inch per 12 inches).

2.3 INSULATION ACCESSORIES

A. Glass (Felt): ASTM D2178, Type VI, heavy duty ply sheet.

B. Cants and Tapered Edge Strips:
   1. Wood Cant Strips: Refer to Division 06 Section "Rough Carpentry."
   2. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
   3. Tapered Edge Strips: 1:12 (one inch per foot), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
      a. Cellulosic Fiberboard: ASTM C208.
      b. Mineral Fiberboard: ASTM C726.
      c. Perlite Board: ASTM C728.

C. Cover Board:
   1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 13 mm (1/2 inch)thick, factory primed.

2.4 FASTENERS

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening substrate board to roof deck.

B. Staples and Nails: ASTM F1667. Type as designated for item anchored and for substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

A. Comply with requirements of Division 07 roofing section.

3.3 RIGID INSULATION INSTALLATION

A. Insulation Installation, General:
   1. Install roof insulation in accordance with roofing system manufacturer's written instructions.
   2. Install roof insulation in accordance with requirements of FM Approval's Listing for specified roofing system.
   3. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate prior to installation of insulation.
   4. Use same insulation as existing for roof repair and alterations unless specified otherwise.

B. Insulation Thickness:

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

C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.

D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.

E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.

F. Cut to fit tight against blocking or penetrations.

G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.

H. Existing Roofs:

1. At areas to be altered or repaired, remove loose insulation and wet insulation.

2. Cut and remove existing insulation and vapor retarder for new work to be installed. Clean cut edges and install a temporary seal to cut surfaces. Use roof cement and one layer of 7 kg (15 lb.) felt strip cut to extend 150 mm (6 inches) on each side of cut surface. Bed strip in roof cement and cover strip with roof cement to completely embed the felt.

I. Installation Method:

1. Adhered Insulation:
   a. Prime substrate as required.
   b. Set each layer of insulation firmly in solid mopping of hot asphalt.
   c. Set each layer of insulation firmly in ribbons of bead-applied insulation adhesive.
   d. Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.
2. Mechanically Fastened Insulation:
   a. Fasten insulation in accordance with FM Approval's "RoofNav" requirement in Division 07 roofing section.
   b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.
3. Mechanically Fastened and Adhered Insulation:
   a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
   b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.
4. Cover Board: Install cover boards over insulation with long joints in continuous straight lines with staggered end joints. Offset cover board joints from insulation joints minimum 150 mm (6 inches). Fasten cover boards according to "Mechanically Fastened Insulation" requirements.

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SECTION 07 40 00
ROOFING AND SIDING PANELS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies insulated metal wall panels shown.

1.2 RELATED WORK

A. Flashing and Sheet Metal: 07 60 00, FLASHING AND SHEET METAL.

B. Sealant: Section 07 92 00, JOINT SEALANTS.

1.3 MANUFACTURER'S QUALIFICATIONS

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

1.4 SUBMITTALS

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

B. Shop Drawings: Wall and roof panels, showing details of construction and installation. Collateral steel framing U value thickness and kind of material, closures, flashing, fastenings and related components and accessories.

C. Manufacturer's Literature and Data: Wall panels.

D. Fire Test Report: Report of fire test by recognized testing laboratory for fire rating specified, showing details of construction.

1.5 APPLICABLE PUBLICATIONS

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

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

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

A463-10.....Steel Sheet, Cold-Rolled, Aluminum-Coated, by the Hot-Dip Process

A924/A924M-10.....Steel Sheet, Metallic Coated by the Hot-Dip Process

A1008/A1008M-10.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy

B209/209M-07.....Aluminum and Aluminum Alloy Sheet and Plate

C1396-11.....Standard Specification for Gypsum Board

C553-08.....Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

C591-09.....Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
C612-10.....Mineral Fiber Block and Board Thermal Insulation
E119-10.....Fire Test of Building Construction and Materials

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Sheathing Panel: Match existing prefabricated steel clad insulated panel backup panel in existing exterior brick veneer walls.

1. Existing panels: Centria Metalwrap Series 200, 3″ horizontal masonry back-up panels with brick veneer ties.

B. Siding Panel: Match existing prefabricated steel clad insulated siding panels on existing exterior prefabricated panel walls

1. Existing panels: Centria Formawall Dimension Series, 3″ horizontal application.

2.3 FASTENERS

A. Fasteners of size, type and holding strength as recommended by manufacturer.

2.4 GYPSUM BACKING BOARD

A. ASTM-D3273, rating 10, Glass mat facer sheets, 5/8 inches thick, Square edge.

2.5 THERMAL INSULATING MATERIALS

A. Urethane or isocyanurate: foamed in core. Density 2.7 lb.cu. ft. minimum, minimum compressive strength 20 lb./sq.in. and containing no CFC or HCFC compounds

2.6 FABRICATION

A. Insulated metal wall and roof panels shall consist of factory formed horizontal wall panel system consisting of an exterior metal sheet with interior metal liner panel, bonded to factory foamed-in-place core in thermally separated profile, with factory sealed tongue-and-groove and rainscreen-design pressure equalized chamber horizontal joint, and attached to support using concealed fasteners. Furnish insulated metal wall panels with horizontal joints as shown on the drawing. Connection between panels shall be by factory sealed tongue and groove and rainscreen design pressure-equalized-chamber horizontal joint. Work shall include collateral steel framing metal and bituminous closures, fastenings, flashing, clip, caulking, and related components and accessories.

2.7 FINISH

A. For insulated wall, the finishes shall be as follows for aluminum face sheets: match existing

1. Fluorocarbon 2 coat finish, consisting of a 0.2 prime coat and a polyvinylidene fluoride finish coat of 0.5 mil minimum dry film thickness on one side, and a wash coat of 0.5 mil minimum dry film thickness applied to reverse side.

C. Finish numbers for aluminum specified herein are in accordance with The Aluminum Association's Designation System. Each aluminum finish number preceded by letters AA identifies it as an Aluminum Association designation.

D. Aluminum alloy used for color coating shall be as required to produce specified color. Color shall be as specified in Section 09 06 00, SCHEDULE FOR FINISHES. Color for sheet aluminum shall not deviate more than the colors of extrusion samples.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install panels in accordance with the manufacturer's approved erection instructions and diagrams, except as specified otherwise. Panels shall be in full and firm contact with supports and with each other at side and end laps. Where panels are cut in the field, or where any of the factory applied coverings or coatings are abraded or damaged in handling or installation, they shall, after the necessary repairs have been made with material of the same type and color as the weather coating, be approved before being installed. All cut ends and edges, including those at openings through the sheets shall be sealed completely. Correct defects or errors in the materials in an approved manner. Replace materials which cannot be corrected in an approved manner with nondefective material. Provide molded closure strips where indicated and whenever sheets terminate with open ends after installation.

B. Wall Panels: Apply panels with the configuration in a vertical position. Provide panels in the longest obtainable lengths, with end laps occurring only at structural members. Seal side and end laps with joint sealing material. Flash and seal walls at the base, at the top, around windows, door frames, framed louvers, and other similar openings. Install closure strips, flashings, and sealing material in an approved manner that will assure complete weather tightness. Flashing will not be required where approved "self-flashing" panels are used.

D. Flashing: All flashing and related closures and accessories in connection with the preformed metal panels shall be provided as indicated and as necessary to provide a watertight installation. Details of installation, which are not indicated, shall be in accordance with the panel manufacturer's printed instruction and details, or the approved shop drawings. Installation shall allow for expansion and contraction of flashing.

E. Fasteners: Fastener spacings shall be in accordance with the manufacturer's recommendations, and as necessary to withstand the design loads indicated. Install fasteners in valleys or crowns as recommended by the manufacturer of the sheet being used. Install fasteners in straight lines within a tolerance of 13 mm (1/2-inch) in the length of a bay. Drive exposed penetrating type fasteners normal to the surface, and to a uniform depth to seat gasketed washers properly, and drive so as not to damage factory applied coating. Exercise extreme care in drilling pilot holes for fastenings to keep drills perpendicular and centered in valleys, or crowns, as applicable. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners shall not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels. Remove metal shavings and filings from roofs on completion to prevent rusting and discoloration of the panels.

3.2 ISOLATION OF ALUMINUM

A. Isolate aluminum in contact with or fastened to dissimilar metals other than stainless steel, white bronze, or other metal compatible with aluminum by one of the following:
   1. Painting the dissimilar metal with a prime coat of Zinc-Molybdate followed by two coats of aluminum paint.
   2. Placing a non-abrasive tape or gasket between the aluminum and the dissimilar metal.

B. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of alkali-resistant bituminous paint.

C. Paint aluminum in contact with wood or other absorptive materials, that may become repeatedly wet, with two coats of bituminous paint, or two coats of aluminum paint. Seal joints with caulking material.

3.3 PROTECTION AND CLEANING

A. Protect panels and other components from damage during and after erection, and until project is accepted by the Government.

B. After completion of work, all exposed finished surfaces of panels shall be cleaned of soil, discoloration and disfiguration. Touch-up abraded surfaces of panels.

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SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 GENERAL

1.1 DESCRIPTION

A. Thermoplastic Polyolefin (TPO) sheet roofing adhered to roof deck.

1.2 RELATED WORK

A. Treated wood framing, blocking, and nailers: Section 06 10 00, ROUGH CARPENTRY

B. Roof Insulation: Section 07 22 00, ROOF AND DECK INSULATION.

C. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):

ANSI/SPRI ES-1-03.....Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):

ASCE/SEI-7-10.....Minimum Design Loads for Buildings and Other Structures

D. ASTM International (ASTM):

C67-09.....Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile

C140-09.....Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

C1371-04.....Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

C1549-04.....Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer

D4263.....Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

D4434-06.....Standard Specification for Poly (Vinyl Chloride) Sheet Roofing

D6878-08.....Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing

E108-10.....Standard Test Methods for Fire Tests of Roof Coverings

E408-71(R2008).....Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques

E1918-06.....Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field

E1980-01.....Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field

E. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

ASHRAE 90.1-2007.....Energy Standard for Buildings Except Low-Rise Residential Buildings, Appendix f.

F. Cool Roof Rating Council:

CRRC-1.....Product Rating Program, www.coolroofs.org

G. FM Approvals: RoofNav Approved Roofing Assemblies and Products.

4450-89.....Approved Standard for Class 1 Insulated Steel Deck Roofs

4470-10.....Approved Standard for Class 1 Roof Coverings

1-28-09.....Loss Prevention Data Sheet: Design Wind Loads.

1-29-09.....Loss Prevention Data Sheet: Above-Deck Roof Components

1-49-09.....Loss Prevention Data Sheet: Perimeter Flashing

H. National Roofing Contractors Association: Roofing and Waterproofing Manual

I. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog, www.biopreferred.gov

J. U.S. Department of Energy (DoE): Roof Products Qualified Product List, www.energystar.gov

1.4 PERFORMANCE REQUIREMENTS

A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

B. Roofing System Energy Performance Requirements: Provide a roofing system identical to components that that have been successfully tested by a qualified independent testing and inspecting agency to meet the following requirements:
   1. Energy Performance, Energy Star: Provide roofing system that is listed on DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
   2. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E1980 based on testing identical products by a qualified testing agency.
   3. Energy Performance, CRRC-1: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.
   4. Energy Performance, Aged: Provide roofing system with minimum three-year aged solar reflectance not less than 0.55 when tested in accordance with ASTM C1549 or ASTM E1918, and in addition, a minimum three-year-aged thermal emittance of 0.75 when tested in accordance with ASTM C1371 or ASTM E408.
      a. Where tested aged values are not available for proposed product, submit calculations to adjust initial solar reflectance to demonstrate compliance as indicated in ASHRAE 90.1-2007 Addendum f.
      b. Alternatively, provide roofing system with minimum three-year aged Solar Reflectance Index of not less than 64 when determined in accordance with the Solar Reflectance Index method in ASTM E1980 using a convection coefficient of 2.1 BTU/h-ft2 (12 W/m2K).

1.5 QUALITY CONTROL

A. Installer Qualifications:
   1. Licensed or approved in writing by manufacturer to perform work under warranty requirements of this Section.
   2. Employ full-time supervisors knowledgeable and experienced in roofing of similar types and scopes, and able to communicate with owner and workers.
B. Inspector Qualifications: Inspection of work by third-party technical inspector or technical representative of manufacturer experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer’s compliance with the requirements of this Project, and approved by the manufacturer to issue

warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer, not engaged in the sale of products.
2. An independent party certified as a Registered Roof Observer by the Roof Consultants Institute (RCI), retained by the Contractor or the Manufacturer and approved by the Manufacturer.

C. Product/Material Requirements:

1. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.

D. Roofing system design standard requirements:

1. Recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to modified bituminous sheet roofing for storage, handling and application.
2. Recommendations of FM Approvals 1-49 Loss Prevention Data Sheet for Perimeter Flashings.
3. Recommendations of ANSI/SPRI ES-1 for roof edge design.
4. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7. Determine the fastener type and spacing needed to resist uplift pressures based on “Wind Load Design Guide for low sloped Flexible Membrane Roofing Systems” published by SPRI.
   a. Basic Wind Speed(3 sec gust, measured at 55 feet above ground, in Exposure B)- 90 MPH
   b. Exposure: “B”, Urban/Suburban/Wooded
   c. Importance Factor: Category IV
   d. Roof Height(s) and Parapet Height(s): As indicated.
   e. Static Pressure of Building Interior: <0.5 inch water.
5. FM Approvals Listing: Provide roofing membrane, base flashing, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a roofing system and that are listed in FM Approvals "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
   a. Fire/Windstorm Classification: Class 1A-90.
   b. Hail Resistance: SH.

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

1.6 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, SAMPLES.
B. Product Data:
   1. Adhesive materials.
   2. Membrane sheet roofing and flashing membrane.
   3. Roofing cement.
   4. Roof walkway.
   5. Fastening requirements.
   6. Application instructions.
D. Samples:
   1. Nails and fasteners, each type.
E. Shop Drawings: Include plans, sections, details, and attachments.
   1. Base flashings and terminations.
F. Certificates:
   1. Indicating materials and method of application of roofing system meets requirements of FM Approvals "RoofNav" for specified fire/windstorm classification.
G. Warranty: As specified.
H. Documentation of supervisors' and inspectors' qualifications.
I. Field reports of roofing inspector.

SPEC WRITER NOTE: Retain paragraph below for reroofing projects.

J. Temporary protection plan. Include list of proposed temporary materials.

K. Contract Close-out Submittals:

1. Maintenance Manuals.
2. Warranty signed by installer and manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to single ply membrane roofing for storage, handling and installation.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Environmental Controls: Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

C. Protection of interior spaces: Refer to Section 01 00 00, GENERAL REQUIREMENTS.

1.9 WARRANTY

Existing roof warranty is in effect. All work shall be in accordance with this warranty and no roof work shall void or compromise in any way this warranty.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

A. TPO Sheet: ASTM D6878, internally fabric or scrim reinforced, 1.5 mm (60 mils) thick. Provide with fabric backing if existing membrane has backing. Match existing.

1. Color: White.

2.2 ACCESSORIES:

A. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as TPO sheet membrane. Match existing.

B. Bonding Adhesive: Manufacturer's standard, water based.

C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 25 by 3 mm (1 by 1/8 inch) thick; with anchors.

D. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 25 mm wide by 1.3 mm (1 inch wide by 0.05 inch) thick, prepunched.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening membrane to substrate.

F. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 5 mm (3/16 inch) thick, and acceptable to membrane roofing system manufacturer. Match existing

G. Miscellaneous Accessories: Provide sealers, preformed flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories acceptable to manufacturer.

2.3 ADHESIVE AND SEALANT MATERIALS:

A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Plastic Foam Adhesives: 50 g/L.
   b. Gypsum Board and Panel Adhesives: 50 g/L.
   c. Multipurpose Construction Adhesives: 70 g/L.
   d. Fiberglass Adhesives: 80 g/L.
   e. Single-Ply Roof Membrane Adhesives: 250 g/L.
   f. Other Adhesives: 250 g/L.
   g. PVC Welding Compounds: 510 g/L.
   h. Adhesive Primer for Plastic: 650 g/L
   i. Single-Ply Roof Membrane Sealants: 450 g/L.
   j. Nonmembrane Roof Sealants: 300 g/L.
   k. Sealant Primers for Nonporous Substrates: 250 g/L.
   l. Sealant Primers for Porous Substrates: 775 g/L.

Minimum Physical Properties – Vapor Retarder		
Property	Test Method	Required Value
Puncture Propagation Tear	ASTM-D256	116 N 26 LBS
Permeance	ASTM-E96	0.036 Perm (US)
Drop Dart	ASTM-D1709, Method B	330 g
Tensile Strength	ASTM-D882	100 LBS / 4,504 PSI
Puncture Strength	ASTM-D4833	26 LBS
Surface Burning Characteristics	ASTM-E84	Class I, Class A

Minimum Physical Properties – Polyisocyanurate Insulation		
Property	Test Method	Required Value
Material Standards	ASTM-C1289	Type II, Class 1
	HH-I-1972	Class 1
Density (nominal)	ASTM-D1622	2 PCF
Long Term Thermal Resistance (LTTR) per unit thickness	CAN / ULCS770	6.0 R per inch
Compressive Strength	ASTM-D1622	20 PSI
Dimensional Stability	ASTM-D2126	2% max., 7 days
Permeance	ASTM-E96	<1.0 Perm (US)
Water Absorption	ASTM-C209	< 1.5% volume
Service Temperature	--	-100 to +250 DegF

Minimum Physical Properties – 60mil, Reinforced, TPO Membrane		
Property	Test Method	Required Value
Tolerance on Nominal Thickness (Max)	ASTM-D751	+/- 10%
Thickness over scrim (Min)	ASTM-D4637	15 mil
	Optical	18 mil
Breaking Strength (Min)	ASTM-D751	225 LBS
	Grab Method	340 LBS
Ultimate Elongation – Fabric Failure (Min)	ASTM-D751	25%
Tear Strength (Min)	ASTM-D751	55 LBS
	B Tongue Tear	130 LBS
Linear Dimensional Change(Shrinkage)	ASTM-D1204	+/- 1.0%
Field Seam - Peel Strength(min)	ASTM-D1876	40 LBS/IN
Permeance (max)	ASTM-E96	<0.1 Perm (US)
Puncture Resistance (min)	FTM 101C Method 2031	250 LBS
Solar Reflectance (albedo X100)	ASTM-E903	80 (White Membrane)
		25 (Gray Membrane)
Brittleness Point	ASTM-D2137	-40 DegF

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions with roofing Installer and roofing inspector to verify compliance with project requirements and suitability to accept subsequent roofing work. Correct unsatisfactory conditions before proceeding with roofing work.

B. Do not apply roofing if roof surface will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless system is protected.

3.2 PREPARATION

A. Complete roof deck construction prior to commencing roofing work:
   1. Install curbs, blocking, edge strips, nailers, cants, and other components where insulation, roofing, and base flashing is attached to, in place ready to receive insulation and roofing.
   2. Complete deck and insulation to provide designed drainage to working roof drains.
   3. Document installation of related materials to be concealed prior to installing roofing work.

B. Dry out surfaces, including the flutes of metal deck that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates.

C. Sweep decks to broom clean condition. Remove all dust, dirt or debris.

D. Remove projections that might damage materials.

E. Concrete Decks:
   1. Test concrete decks for moisture prior to application of roofing materials. Test for capillary moisture by plastic sheet method according to ASTM D4263.
   2. Prime concrete decks, including precast units, with primer as specified. Keep primer back four inches from joints in precast units.
   3. Allow primer to dry before application of adhesive.

F. Insulating Concrete Decks:
   1. Allow to dry out for at least five days after installation before the placement of materials.
   2. If rain occurs during or at end of drying period or during installation of roofing, allow additional drying time before the placement of the roofing materials.

G. Existing Membrane Roofs and Repair Areas:

1. At areas to be altered or repaired, remove loose, damaged, or cut sheet that is not firmly adhered only where new penetrations occur or repairs are required.
2. Cut and remove existing roof membrane for new work to be installed. Clean cut edges and install a temporary seal to cut surfaces. Use roof cement and one layer of 7 Kg (15 pound) felt strip cut to extend 150 mm (6 inches) on each side of cut surface. Bed strip in roof cement and cover strip with roof cement to completely embed the felt.
3. At modified bituminous base flashing to be repaired, either bend up cap flashing or temporarily remove cap flashing. Brush and scrape away all deteriorated sheets or surface material of base flashing.

3.3 TEMPORARY PROTECTION

A. Install temporary protection at the end of day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent. Comply with approved temporary protection plan.
B. Install temporary cap flashing over the top of base flashings where permanent flashings are not in place to provide protection against moisture entering the roof system through or behind the base flashing. Securely anchor in place to prevent blow off and damage by construction activities.
C. Provide for removal of water or drainage of water away from the work.
D. Provide temporary protection over installed roofing by means of duckboard walkways, plywood platforms, or other materials, as approved by Resident Engineer, for roof areas that are to remain intact, and that are subject to foot traffic and damage. Provide notches in sleepers to permit free drainage.

3.4 INSTALLATION, GENERAL

A. FM Approvals Installation Standard: Install roofing membrane, base flashings, wood cants, blocking, curbs, and nailers, and component materials in compliance with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system as listed in FM Approval's "RoofNav" for fire/windstorm classification indicated. Comply with recommendations in FM Approvals' Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.
B. NRCA Installation Standard: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations.
C. Manufacturer Recommendations: Comply with roofing system manufacturer's written installation recommendations.

D. Coordination with related work: Coordinate roof operations with roof insulation and sheet metal work so that insulation and flashings are installed concurrently to permit continuous roofing operations.

E. Installation Conditions:

1. Apply dry roofing materials. Apply roofing work over dry substrates and materials.
2. Apply materials within temperature range and surface and ambient conditions recommended by manufacturer.
3. Except for temporary protection, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, ice, fog or frost) is present in any amount in or on the materials to be covered or installed:
   a. Do not apply materials when the temperature is below 4 deg. C (40 deg. F).
   b. Do not apply materials to substrate having temperature of 4 deg. C (40 deg. F) or less.

3.5 INSTALLATION OF TPO ROOFING

A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with TPO.

B. Install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.

C. Commence installation at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet.

D. Position the membrane so it is free of buckles and wrinkles.

E. Roll sheet out on deck; inspect for defects as being rolled out and remove defective areas. Allow for relaxing before proceeding.

1. Lap edges and ends of sheets 50 mm (two inches) or more as recommended by the manufacturer.
2. Heat weld laps. Apply pressure as required. Seam strength of laps as required by ASTM D4434.
3. Check seams to ensure continuous adhesion and correct defects.
4. Finish edges of laps with a continuous beveled bead of sealant to sheet edges to provide smooth transition.
5. Finish seams as the membrane is being installed (same day).
6. Anchor perimeter to deck or wall as specified.

F. Repair areas of welded seams where samples have been taken or marginal welds, bond voids, or skips occurs.

G. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (four-inches) beyond cut.

H. Membrane Perimeter Anchorage:
   1. Install metal fastening strip at the perimeter of each roof level, curb flashing, expansion joints and similar penetrations as indicated and in accordance with membrane manufacturer's instructions on top of roof membrane to deck or wall.
   2. Mechanically Fastened Metal Fastening Strip:
      a. Set top of mechanical fastener set flush with top surface of the metal fastening strip. Space mechanical fasteners a maximum 300 mm (12 inches) on center starting 25 mm (one inch) from the end of the nailing strip.
      b. When strips are cut round corners and eliminate sharp corners.
      c. After mechanically fastening strip cover and seal strip with a six-inch wide roof membrane strip; heat weld to roof membrane and seal edges.
      d. At roof edge metal, turn the membrane down over the front edge of the blocking or the nailer to below blocking. Secure the membrane to the vertical portion of the nailer; or, if required by the membrane manufacturer with fasteners spaced not over 300 mm (12 inches) on centers.
      e. At parapet walls, intersecting building walls and curbs, secure the membrane to the structural deck with fasteners 300 mm (12 inches) on centers or as shown on NRCA manual.

I. Adhered System:
   1. Apply adhesive in quantities required by roof membrane manufacturer.
   2. Fold sheet back on itself after rolling out and coat the bottom side of the membrane and the top of the deck with adhesive. Do not coat the lap joint area.
   3. After adhesive has set according to adhesive manufacturers application instruction, roll the membrane into the adhesive in a manner that minimizes voids and wrinkles.
   4. Repeat for other half of sheet. Cut voids and wrinkles to lay flat and clean for repair patch over cut area.

J. Mechanically-Attached System:
   1. Secure the membrane to the structural deck with fasteners through stress plate or batten strips spaced and patterned in accordance with the membrane manufacturer's instructions to achieve specified wind uplift performance.

2. When fasteners are installed within the laps of adjoining sheets, position the fastener so that the stress plates are a minimum 13 mm (1/2)inch) from the edge of the sheets.
3. Where fasteners are installed over the membrane after the seams have been welded, cover the fasteners with a minimum 175 mm (seven inch) wide round TPO membrane cap centered over the fasteners. If batten strips are used cover the strip with a minimum 175 mm (seven inch) wide TPO strip centered over the batten. Heat weld to the roof membrane and finish edges with sealant as specified. Finish edges with sealant as specified.
4. Before installing fasteners into cast in place concrete, pre-drill the correct size hole into the deck. Drill the hole 9 mm (3/8 inch) deeper than the fastener penetration.

3.6 INSTALLATION OF FLASHING

A. Install flashings as the membrane is being installed. If the flashing can not be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.
B. Flashing Roof Drains:
   1. Install roof drain flashing as recommended by the membrane manufacturer, generally as follows:
      a. Coordinate to set the metal drain flashing in asphalt roof cement, holding cement back from the edge of the metal flange.
      b. Do not allow the roof cement to come in contact with the TPO roof membrane.
      c. Adhere the TPO roof membrane to the metal flashing with the membrane manufacturer's recommended adhesive.
   2. Turn down the metal drain flashing and TPO roof membrane into the drain body and install clamping ring and strainer.
C. Installing TPO Base Flashing and Pipe Flashing:
   1. Install TPO flashing membranes to pipes, wall or curbs to a height not less than eight-inches above roof surfaces and 100 mm (four inches) on roof membrane.
      a. Adhere flashing to pipe, wall or curb with adhesive.
      b. Form inside and outside corners of TPO flashing membrane in accordance with NRCA manual. Form pipe flashing in accordance with NRCA manual use pipe boot.
      c. Lap ends not less than 100 mm (four inches).

d. Heat weld flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.
e. Install flashing membranes in accordance with NRCA manual.

2. Anchor top of flashing to walls or curbs with fasteners spaced not over 200 mm (eight inches) on centers. Use fastening strip on ducts. Use pipe clamps on pipes or other round penetrations.
3. Apply sealant to top edge of flashing.

D. Repairs to membrane and flashings:
1. Remove sections of TPO sheet roofing or flashing that is creased wrinkled or fishmouthed.
2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (four inches) beyond damaged, cut, or removed area. Heat weld to roof membrane or flashing. Finish edge of lap with sealant as specified.

3.7 FLEXIBLE WALKWAYS

A. Use reinforced sheet not less than 900 mm (three feet) wide.
B. Heat weld walkway sheet to roof sheet at edges. Weld area 50 mm (two inches) wide by the entire length of the walkway sheet.
C. Finish edges of laps with sealants as specified.

3.8 FIELD QUALITY CONTROL:

A. Roofing Inspector: Owner will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.
1. Examine and probe seams in the membrane and flashing in the presence of Resident Engineer and Membrane Manufacturer's Inspector.
2. Probe edge of welded seams with a blunt tipped instrument. Use sufficient hand pressure to detect marginal welds, voids, skips, and fishmouths.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

D. Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of acceptance by Owner.

C. Clean overspray and spillage from adjacent construction. Clean membrane and restore surface to like-new condition meeting solar reflectance requirements.

- - - E N D - - -

SECTION 07 60 00
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

Formed sheet metal work for wall and roof flashing, as specified in this section.

1.2 RELATED WORK

A. Manufactured flashing, copings, roof edge metal, and fasciae: Section 07 71 00 ROOF SPECIALTIES.

B. Roofing and Siding Panels: Section 07 40 00

C. Joint Sealants: Section 07 92 00, JOINT SEALANTS.

D. Integral flashing components of manufactured roof specialties and accessories or equipment: Section 07 71 00, ROOF SPECIALTIES; +9Division 22, PLUMBING sections and Division 23 HVAC sections.

F. Paint materials and application: Section 09 91 00, PAINTING.

G. Flashing of Roof Drains: Section 22 14 00, FACILITY STORM DRAINAGE.

1.3 SUBMITTALS

A.

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

B. Aluminum Association (AA):

AA-C22A41.....Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick

AA-C22A42.....Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick

AA-C22A44.....Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class I Architectural, 0.7-mil thick finish

C. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):

ANSI/SPRI ES-1-03.....Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

D. American Architectural Manufacturers Association (AAMA):

AAMA 620.....Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum

AAMA 621.....Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates

E. ASTM International (ASTM):

A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

A653/A653M-09.....Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process

B32-08.....Solder Metal

B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate

B370-09.....Copper Sheet and Strip for Building Construction

D173-03.....Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing

D412-06.....Vulcanized Rubber and Thermoplastic Elastomers-Tension

D1187-97(R2002).....Asphalt Base Emulsions for Use as Protective Coatings for Metal

D1784-08.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

D3656-07.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

D4586-07.....Asphalt Roof Cement, Asbestos Free

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.

G. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual

H. Federal Specification (Fed. Spec):

A-A-1925A.....Shield, Expansion; (Nail Anchors)

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

I. International Code Commission (ICC): International Building Code, Current Edition

1.4 PERFORMANCE REQUIREMENTS

A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:

1. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 lbf/sq. ft.): 2.87-kPa (60-lbf/sq. ft.) perimeter uplift force, 4.31-kPa (90-lbf/sq. ft.) corner uplift force, and 1.44-kPa (30-lbf/sq. ft.) outward force.

1.5 SUBMITTALS

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

B. Shop Drawings: For all specified items, including:

1. Flashings

C. Manufacturer's Literature and Data: For all specified items, including:

1. Two-piece counterflashing
2. Thru wall flashing
3. Copper clad stainless steel
4. Polyethylene coated copper
5. Bituminous coated copper
6. Copper covered paper
7. Fascia-cant

D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

E. Provide 2” x 2” x 1/18” extruded aluminum samples of the specified type showing the range of colors available to match existing exterior wall panels.

PART 2 - PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS

A. Stainless Steel: ASTM A167, Type 302B, dead soft temper.

B. Copper ASTM B370, cold-rolled temper.

C. Bituminous Coated Copper: Minimum copper ASTM B370, weight not less than 1 kg/m² (3 oz/sf). Bituminous coating shall weigh not less than 2

kg/m² (6 oz/sf); or, copper sheets may be bonded between two layers of coarsely woven bitumen-saturated cotton fabric ASTM D173. Exposed fabric surface shall be crimped.

D. Copper Covered Paper: Fabricated of electro-deposit pure copper sheets ASTM B 370, bonded with special asphalt compound to both sides of creped, reinforced building paper, UU-B-790, Type I, style 5, or to a three ply sheet of asphalt impregnated creped paper. Grooves running along the width of sheet.

E. Polyethylene Coated Copper: Copper sheet ASTM B370, weighing 1 Kg/m² (3 oz/sf) bonded between two layers of (two mil) thick polyethylene sheet.

F. Aluminum Sheet: ASTM B209, alloy 3003-H14 //except alloy used for color anodized aluminum shall be as required to produce specified color. Alloy required to produce specified color shall have the same structural properties as alloy 3003-H14//.

G. Galvanized Sheet: ASTM, A653.

2.2 FLASHING ACCESSORIES

A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.

B. Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m²(6 lbs/100 sf).

C. Bituminous Paint: ASTM D1187, Type I.

D. Fasteners:

1. Use copper, copper alloy, bronze, brass, or stainless steel for copper and copper clad stainless steel, and stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.

2. Nails:

a. Minimum diameter for copper nails: 3 mm (0.109 inch).

b. Minimum diameter for aluminum nails 3 mm (0.105 inch).

c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.

d. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.

3. Rivets: Not less than 3 mm (1/8 inch) diameter.

4. Expansion Shields: Fed Spec A-A-1925A.

E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.

F. Insect Screening: ASTM D3656, 18 by 18 regular mesh.

G. Roof Cement: ASTM D4586.

2.3 SHEET METAL THICKNESS

A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:

B. Concealed Locations (Built into Construction):

1. Copper: 30g (10 oz) minimum 0.33 mm (0.013 inch thick).
2. Stainless steel: 0.25 mm (0.010 inch) thick.
3. Copper clad stainless steel: 0.25 mm (0.010 inch) thick.
4. Galvanized steel: 0.5 mm (0.021 inch) thick.

C. Exposed Locations:

1. Copper: 0.4 Kg (16 oz).
2. Stainless steel: 0.4 mm (0.015 inch).
3. Copper clad stainless steel: 0.4 mm (0.015 inch).

D. Thickness of aluminum or galvanized steel is specified with each item.

2.4 FABRICATION, GENERAL

A. Jointing:

1. In general, copper, stainless steel and copper clad stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
2. Jointing of copper over 0.5 Kg (20 oz) weight or stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
3. Joints shall conform to following requirements:
   a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.
   b. Lap joints subject to stress shall finish not less than 25 mm (one inch) wide and shall be soldered and riveted.
   c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.
4. Flat and lap joints shall be made in direction of flow.
5. Edges of bituminous coated copper, copper covered paper, and polyethylene coated copper shall be jointed by lapping not less than 100 mm (4 inches) in the direction of flow and cementing with asphalt roof cement or sealant as required by the manufacturer's printed instructions.

6. Soldering:
   a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) of uncoated copper, stainless steel, and copper clad stainless steel.
   b. Wire brush to produce a bright surface before soldering lead coated copper.
   c. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
   d. Completely remove acid and flux after soldering is completed.

B. Expansion and Contraction Joints:
   1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
   2. Space joints as shown or as specified.
   3. Space expansion and contraction joints for copper, stainless steel, and copper clad stainless steel at intervals not exceeding 7200 mm (24 feet).
   4. Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
   5. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
   6. Fabricate joint covers of same thickness material as sheet metal served.

C. Cleats:
   1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
   2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
   3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
   4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

D. Edge Strips or Continuous Cleats:

1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.
2. Except as otherwise specified, fabricate edge strips of minimum 0.6 mm (0.024 inch) thick stainless steel.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).

E. Drips:
1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

F. Edges:
1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
3. All metal roof edges shall meet requirements of IBC, current edition.

G. Metal Options:
1. Where options are permitted for different metals use only one metal throughout.
2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.
3. Where copper gravel stops, copings and flashings will carry water onto cast stone, stone, or architectural concrete, or stainless steel.

2.5 FINISHES

A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.

B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.

C. Finish exposed metal surfaces as follows, unless specified otherwise:

1. Stainless Steel: Finish No. 2B or 2D.
2. Aluminum:
   a. Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1 Architectural, 18 mm (0.7 mils) thick.
   b. Colored Finish: AA-C22A42 (anodized) or AA-C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1 Architectural, 18 mm (0.7 mils) thick. Dyes will not be accepted.
   c. Fluorocarbon Finish: AAMA 620, high performance organic coating.
   d. Mill finish.

2.6 THROUGH-WALL FLASHINGS

A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.

1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
2. Fabricate so keying nests at overlaps.

B. For Masonry Work When Concealed Except for Drip:

1. Either copper, stainless steel, or copper clad stainless steel.
2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.

C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:

1. Use same metal and thickness as counter flashing.
2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
3. Form exposed portion as snap lock receiver for counter flashing upper edge.

E. Window Sill Flashing and Lintel Flashing:

1. Use either copper, stainless steel, copper clad stainless steel plane flat sheet, or nonreinforced elastomeric sheeting, bituminous coated copper, copper covered paper, or polyethylene coated copper.
2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
3. Turn up back edge as shown.
4. Form exposed portion with drip as specified or receiver.

F. Door Sill Flashing:
1. Where concealed, use either 0.5 Kg (20 oz) copper, 0.5 mm (0.018 inch) thick stainless steel, or 0.5 mm (0.018 inch) thick copper clad stainless steel.
2. Where shown on drawings as combined counter flashing under threshold, sill plate, door sill, or where subject to foot traffic, use either 0.6 Kg (24 ounce) copper, 0.6 mm (0.024 inch) stainless steel, or 0.6 mm (0.024 inch) thick stainless steel.
3. Fabricate flashing at ends to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening with folded corners.

E. Pipe Flashing: (Other than engine exhaust or flue stack)
1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
   a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
   b. Allow for loose fit around and into the pipe.
4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
   a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
   b. Allow for loose fit around pipe.

2.7 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. Either copper or stainless steel, unless specified otherwise.
B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:
1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.

2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
4. Manufactured assemblies may be used.
5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.

C. Two-Piece Counterflashing:
1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
2. Counterflashing upper edge designed to snap lock into receiver.

D. Pipe Counterflashing:
1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
2. Fabricate 100 mm (4 inch) over lap at end.
3. Fabricate draw band of same metal as counter flashing. Use 0.6 Kg (24 oz) copper or 0.33 mm (0.013 inch) thick stainless steel or copper coated stainless steel.
4. Use stainless steel bolt on draw band tightening assembly.
5. Vent pipe counter flashing may be fabricated to omit draw band and turn down 25 mm (one inch) inside vent pipe.

E. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.

3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nails not over 100 mm (4 inches) on center unless specified otherwise.
8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.

14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
    a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
    b. Paint dissimilar metal with a coat of bituminous paint.
    c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
    a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
    b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

3.2 THROUGH-WALL FLASHING

A. General:
1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.
2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches)and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.

8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
11. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.

D. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint.

E. Flashing at Veneer Walls:
1. Install near line of finish floors over shelf angles or where shown.
2. Turn up against sheathing.
3. At stud framing, hem top edge 19 mm (3/4 inch) and secure to each stud with stainless steel fasteners through sheathing.
4. At concrete backing, extend flashing into reglet as specified.
5. Coordinate with installation of waterproofing or asphalt felt for lap over top of flashing.

F. Lintel Flashing when not part of shelf angle flashing:
1. Install flashing full length of lintel to nearest vertical joint in masonry over veneer.
2. Turn ends up 25 mm (one inch) and fold corners to form dam and extend end to face of wall.
3. Turn back edge up to top of lintel; terminate back edge as specified for back-up wall.

G. Window Sill Flashing:

1. Install flashing to extend not less than 100 mm (4 inch) beyond ends of sill into vertical joint of masonry or veneer.
2. Turn back edge up to terminate under window frame.
3. Turn ends up 25 mm (one inch) and fold corners to form dam and extend to face of wall.

H. Door Sill Flashing:

1. Install flashing under bottom of plate sills of doors over curbs opening onto roofs. Extend flashing out to form counter flashing or receiver for counter flashing over base flashing. Set in sealant.
2. Extend sill flashing 200 mm (8 inch) beyond jamb opening. Turn ends up one inch in vertical masonry joint, extend end to face of wall. Join to counter flashing for water tight joint.
3. Where doors thresholds cover over waterproof membranes install sill flashing over water proof membrane under thresholds. Extend beyond opening to cover exposed portion of waterproof membrane and not less than 150 mm (6 inch) beyond door jamb opening at ends. Turn up approximately 6 mm (1/4 inch) under threshold.

3.4 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. General:

1. Install counterflashing over and in conjunction with installation of base flashings, except as otherwise specified or shown.
2. Install counterflashing to lap base flashings not less than 100 mm (4 inch).
3. Install upper edge or top of counterflashing not less than 225 mm (9 inch) above top of the roofing.
4. Lap joints not less than 100 mm (4 inch). Stagger joints with relation to metal base flashing joints.
5. When fastening to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. Use screws to wood and sheet metal. Set fasteners in mortar joints of masonry work.

B. Two-Piece Counterflashing:

1. Where receiver is installed at new masonry coordinate to insure proper height, embed in mortar, and lap.
2. Insert counter flashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.

C. Where vented edge occur install so lower edge of counterflashing is against base flashing.

D. When counter flashing is a component of other flashing install as shown.

3.13 GOOSENECK ROOF VENTILATORS

A. Install on structural curb not less than 200 mm (8 inch) high above roof surface.

B. Securely anchor ventilator curb to structural curb with fasteners spaced not over 300 mm (12 inch) on center.

C. Anchor gooseneck to curb with screws having nonprene washers at 150 mm (6 inch) on center.

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SECTION 07 71 00
ROOF SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies equipment supports, pipe curb assemblies, tie-back anchors.

1.2 RELATED WORK

A. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.

C. General insulation: Section 07 21 13, THERMAL INSULATION. Rigid insulations for roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY CONTROL

A. All roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.

B. Each accessory type shall be the same and be made by the same manufacturer.

C. Each accessory shall be completely assembled to the greatest extent possible before delivery to the site.

1.4 SUBMITTALS

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

C. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.

D. Manufacturer's Literature and Data: Each item specified.

E. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.5 APPLICABLE PUBLICATIONS

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

C. American Society for Testing and Material (ASTM):

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

B209/209M-07.....Aluminum and Aluminum Alloy-Sheet and Plate

B221/221M-08.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

D1187-97(R2002).....Asphalt-Base Emulsions for Use as Protective Coatings for Metal

D. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series.....Metal Finishes Manual

E. American Architectural Manufacturers Association (AAMA):
2605-11.....High Performance Organic Coatings on Architectural Extrusions and Panels.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum, Extruded: ASTM B221/B221M.
B. Aluminum Sheet: ASTM B209/B209M.
C. Galvanized Sheet Steel: ASTM A526/A526M; G-90 coating.

2.3 EQUIPMENT SUPPORTS

A. Fabricate equipment supports from 1.3 mm (0.0516 inch) thick galvanized steel.
B. Form exterior curb with integral base, and deck closures for curbs installed on steel decking.
C. Use galvanized steel liners for curbs having inside dimension over 305 mm (12 inches).
D. Fabricate curb with a minimum height of 200 mm (8 inches) above roof surface.
E. Attach preservative treated wood nailers to top of curb. Use 50 mm (2 inch) by 50 mm (2 inch) minimum nominal size on curb with openings and 50 mm (2 inch) thick, width of curb up to 300 mm (12 inches) on equipment support curbs.
F. Make size of supports suit size of equipment furnished, with height as shown on drawings, but not less than 200 mm (8 inches) above roof surface.

2.~~6~~ FINISH

A. In accordance with NAAMM Amp 500 Series.
B. Aluminum, Mill Finish: AA-MIX, as fabricated.

2.~~6~~ TIE BACK ANCHORS

A. Galvanized post with stainless steel eye and through bold connection or weld to structure as required: Flexible Line Systems. Verify required tie back height and bolt length to suite existing conditions and required minimum height indicated.

2.~~6~~ PIPE CURB ASSEMBLIES

A. Insulated curb with thermoplastic cap: The Pate Company. Sizes as needed for number and type of penetrations required. Top of curb 12” minimum above finish roof surface.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof specialties where shown.

B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.

C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.

D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.

E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.

   b. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.

   c. Install expansion joint cover with 6 mm (1/4 inch) wide space at end joints and tension bars at 600 mm (24 inches) on center.

   d. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 100 mm (4 inches).

J. Equipment Supports: Do not anchor to insulating concrete or metal deck. Anchor only to building structure as per manufacturers recommendations.

3.2 PROTECTION OF ALUMINUM

A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.

B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

3.3 ADJUSTING

A. Adjust roof hatch hardware to operate freely and so that cover will operate without binding, close tightly at perimeter, and latch securely.

3.4 PROTECTION

Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

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SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.1 DESCRIPTION

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

B. Closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 RELATED WORK

A. Expansion and seismic joint firestopping: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.

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

C. Sealants and application: Section 07 92 00, JOINT SEALANTS.

D. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS.

1.3 SUBMITTALS

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

B. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.

C. List of FM, UL, or WH classification number of systems installed.

D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

1.4 DELIVERY AND STORAGE

A. Deliver materials in their original unopened containers with manufacturer’s name and product identification.

B. Store in a location providing protection from damage and exposure to the elements.

1.5 WARRANTY

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

1.6 QUALITY ASSURANCE

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

1.7 APPLICABLE PUBLICATIONS

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

B. American Society for Testing and Materials (ASTM):
E84-10.....Surface Burning Characteristics of Building Materials
E814-11.....Fire Tests of Through-Penetration Fire Stops

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

D. Underwriters Laboratories, Inc. (UL):
Annual Issue Building Materials Directory
Annual Issue Fire Resistance Directory
1479-10.....Fire Tests of Through-Penetration Firestops

E. Warnock Hersey (WH):
Annual Issue Certification Listings

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

A. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.

B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 100 mm (4 in) nominal pipe or 0.01 m^2 (16 sq. in.) in overall cross sectional area.

C. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.

D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
1. Contain no flammable or toxic solvents.
2. Have no dangerous or flammable out gassing during the drying or curing of products.

3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
4. When used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials shall have following properties:
1. Classified for use with the particular type of penetrating material used.
2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
3. Intumescent products which would expand to seal the opening and act as fire, smoke, toxic fumes, and, water sealant.

F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84.

G. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.

H. Materials to be asbestos free.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS

A. Use silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.

B. Use mineral fiber filler and bond breaker behind sealant.

C. Sealants shall have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with E84.

D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Remove dirt, grease, oil, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.

B. Remove insulation on insulated pipe for a distance of 150 mm (six inches) on either side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.

3.3 INSTALLATION

A. Do not begin work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.

B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.

C. Install smoke stopping seals in smoke partitions.

3.4 CLEAN-UP AND ACCEPTANCE OF WORK

A. As work on each floor is completed, remove materials, litter, and debris.

B. Do not move materials and equipment to the next-scheduled work area until completed work is inspected and accepted by the Resident Engineer.

C. Clean up spills of liquid type materials.

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SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

A. Masonry control and expansion joint: Section 04 20 00, UNIT MASONRY.

B. Firestopping penetrations: Section 07 84 00, FIRESTOPPING.

C. Glazing: Section 08 80 00, GLAZING.

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 AND STEAM GENERATION.

1.3 QUALITY CONTROL:

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
3. Test elastomeric joint sealants according to SWRI’s Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

E. 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. Sealants
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.

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. S-1:

1. ASTM C920, polyurethane.
2. Type M.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 20-40

B. S-9:
1. ASTM C920 silicone.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Non-yellowing, mildew resistant.

C. S-12:
1. ASTM C920, polyurethane.
2. Type M/S.
3. Class 25, joint movement range of plus or minus 50 percent.
4. Grade P/NS.
5. Shore A hardness of 25 to 50.

2.2 SEALANT FOR INTERIOR NON-MOVING JOINTS:

A. C-1: ASTM C834, acrylic latex.

B. C-2: One component acoustical caulking, non drying, non hardening, synthetic rubber.

2.3 COLOR:

A. Sealants used with exposed masonry shall match color of mortar joints.

B. Sealants used with unpainted concrete shall match color of adjacent concrete.

C. Color of sealants for other locations shall be light gray or aluminum, unless specified otherwise.

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 sealant material.

B. Stain free type.

2.7 CLEANERS-NON POUROUS SURFACES:

Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.

B. Coordinate for repair and resolution of unsound substrate materials.

C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

A. Prepare joints in accordance with manufacturer's instructions and SWRI.

B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.

1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

C. Do not cut or damage joint edges.

D. Apply masking tape to face of surfaces adjacent to joints before applying primers, 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 sealing compound in accordance with manufacturer's printed instructions.
5. Avoid dropping or smearing compound on adjacent surfaces.
6. Fill joints solidly with compound and finish compound smooth.
7. Tool joints to concave surface unless shown or specified otherwise.
8. Finish paving or floor joints flush unless joint is otherwise detailed.
9. Apply compounds with nozzle size to fit joint width.
10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.

B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.

C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all

cut-outs and intersections with the adjoining construction unless specified otherwise.

1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements.

3.7 CLEANING:

A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.

B. After filling and finishing joints, remove masking tape.

C. Leave adjacent surfaces in a clean and unstained condition.

3.8 LOCATIONS:

A. Exterior Building Joints, Horizontal and Vertical:

1. Metal to Metal: Type S-1, S-2
2. Metal to Masonry or Stone: Type S-1
3. Masonry to Masonry or Stone: Type S-1
6. Threshold Setting Bed: Type S-1
7. Masonry Expansion and Control Joints: Type S-1
8. Wood to Masonry: Type S-1

B. Metal Reglets and Flashings:

1. Flashings to Wall: Type S-1
2. Metal to Metal: Type S-1

C. Sanitary Joints:

1. Walls to Plumbing Fixtures: Type S-9
2. Counter Tops to Walls: Type S-9
3. Pipe Penetrations: Type S-9

F. Interior Caulking:

1. Typical Narrow Joint 6 mm, (1/4 inch) or less at Walls and Adjacent Components: Types C-1 and C-2.
2. Perimeter of Doors, Windows, Access Panels which Adjoin Concrete or Masonry Surfaces: Types C-1 and C-2.
3. Joints at Masonry Walls and Columns, Piers, Concrete Walls or Exterior Walls: Types C-1 and C-2.
5. Exposed Isolation Joints at Top of Full Height Walls: Types C-1 and C-2.
6. Exposed Acoustical Joint at Sound Rated Partitions Type C-2.
7. Concealed Acoustic Sealant Types S-4, C-1 and C-2.

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SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies steel doors, steel frames and related components.

B. Terms relating to steel doors and frames as defined in ANSI A123.1 and as specified.

1.2 RELATED WORK

A. Sliding Aluminum Doors: Section 08 41 13

B. Interior Wood Doors: 08 14 11

C. Door Hardware: Section 08 71 00, DOOR HARDWARE.

D. Glazing: 08 80 00

M. Card readers and biometric devices: By Owner

1.3 TESTING

An independent testing laboratory shall perform testing.

1.4 SUBMITTALS

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

B. Manufacturers Literature and Data:

1. Fire rated doors and frames, showing conformance with NFPA 80 and Underwriters Laboratory, Inc., or Intertek Testing Services or Factory Mutual fire rating requirements // and temperature rise rating for stairwell doors. Submit proof of temperature rating //.
2. Sound rated doors, including test report from Testing Laboratory.

1.5 SHIPMENT

A. Prior to shipment label each door and frame to show location, size, door swing and other pertinent information.

B. Fasten temporary steel spreaders across the bottom of each door frame.

1.6 STORAGE AND HANDLING

A. Store doors and frames at the site under cover.

B. Protect from rust and damage during storage and erection until completion.

1.7 APPLICABLE PUBLICATIONS

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

B. Federal Specifications (Fed. Spec.):
L-S-125B.....Screening, Insect, Nonmetallic

C. Door and Hardware Institute (DHI):
A115 Series.....Steel Door and Frame Preparation for Hardware, Series A115.1 through A115.17 (Dates Vary)

D. Steel Door Institute (SDI):
113-01.....Thermal Transmittance of Steel Door and Frame Assemblies
128-1997.....Acoustical Performance for Steel Door and Frame Assemblies
A250.8-03.....Standard Steel Doors and Frames

E. American Society for Testing and Materials (ASTM):
A167-99(R2004).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
A568/568-M-07.....Steel, Sheet, Carbon, and High-Strength, Low-alloy, Hot-Rolled and Cold-Rolled
A1008-08.....Steel, sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability
B209/209M-07.....Aluminum and Aluminum-Alloy Sheet and Plate
B221/221M-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes
D1621-04.....Compressive Properties of Rigid Cellular Plastics
D3656-07.....Insect Screening and Louver Cloth Woven from Vinyl Coated Glass Yarns
E90-04.....Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions

F. The National Association Architectural Metal Manufactures (NAAMM):
Metal Finishes Manual (1988 Edition)

G. National Fire Protection Association (NFPA):
80-09.....Fire Doors and Fire Windows

H. Underwriters Laboratories, Inc. (UL):
Fire Resistance Directory

I. Intertek Testing Services (ITS):
Certifications Listings…Latest Edition

J. Factory Mutual System (FM): Approval Guide

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A167, Type 302 or 304; finish, NAAMM Number 4.

B. Sheet Steel: ASTM A1008, cold-rolled for panels (face sheets) of doors.

C. Anchors, Fastenings and Accessories: Fastenings anchors, clips connecting members and sleeves from zinc coated steel.

D. Aluminum Sheet: ASTM B209/209M.

E. Aluminum, Extruded: ASTM B221/221M.

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

2.2 FABRICATION GENERAL

A. GENERAL:

1. Follow SDI A250.8 for fabrication of standard steel doors, except as specified otherwise. Doors to receive hardware specified in Section 08 71 00, DOOR HARDWARE. Tolerances as per SDI A250.8. Thickness, 44 mm (1-3/4 inches), unless otherwise shown.
2. Close top edge of exterior doors flush and seal to prevent water intrusion.
3. When vertical steel stiffeners are used for core construction, fill spaces between stiffeners with mineral fiber insulation.

B. Heavy Duty Doors: SDI A250.8, Level 2, Model 2 of size and design shown. Core construction types a, d, or f, for interior doors, and, types b, c, e, or f, for exterior doors.

C. Extra Heavy Duty Doors: SDI A250.8, Level 3, Model 2 of size and design shown. Core construction Types d or f, for interior doors, and Types b, c, e, or f, for exterior doors. Use for stairwell doors

D. Smoke Doors:

1. Close top and vertical edges flush.
2. Provide seamless vertical edges.
3. Apply Steel astragal to the meeting style at the active leaf of pair of doors or double egress doors.
4. Provide clearance at head, jamb and sill as specified in NFPA 80.

E. Fire Rated Doors (Labeled):

1. Conform to NFPA 80 when tested by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual for the class of door or door opening shown.
2. Fire rated labels of metal, with raised or incised markings of approving laboratory shall be permanently attached to doors.

3. Close top and vertical edges of doors flush. Vertical edges shall be seamless. Apply steel astragal to the meeting stile of the active leaf of pairs of fire rated doors, except where vertical rod exit devices are specified for both leaves swinging in the same direction.
4. Construct fire rated doors in stairwell enclosures for maximum transmitted temperature rise of 230 °C (450 °F) above ambient temperature at end of 30 minutes of fire exposure when tested in accordance with ASTM E152.

2.3 METAL FRAMES

A. General:
1. SDI A250.8, 1.3 mm (0.053 inch) thick sheet steel, types and styles as shown or scheduled.
2. Frames for exterior doors: Fabricate from 1.7 mm (0.067 inch) thick galvanized steel conforming to ASTM A525.
3. Frames for labeled fire rated doors // and windows //.
   a. Comply with NFPA 80. Test by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual.
   b. Fire rated labels of approving laboratory permanently attached to frames as evidence of conformance with these requirements. Provide labels of metal or engraved stamp, with raised or incised markings.
4. Frames for doors specified to have automatic door operators: minimum 1.7 mm (0.067 inch) thick.
5. Knocked-down frames are not acceptable.

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

SPEC WRITER NOTE: Concealed door closers are generally limited to corridor doors to patient operating rooms.

C. Terminated Stops: SDI A250.8.

D. Glazed Openings:
   a. Integral stop on exterior, corridor, or secure side of door.

b. Design rabbet width and depth to receive glazing material or panel shown or specified.

E. Frame Anchors:

1. Floor anchors:

a. Where floor fills occur, provide extension type floor anchors to compensate for depth of fill.

b. At bottom of jamb use 1.3 mm (0.053 inch) thick steel clip angles welded to jamb and drilled to receive two 6 mm (1/4 inch) floor bolts. Use 50 mm x 50 mm (2 inch by 2 inch) 9 mm by (3/8 inch) clip angle for lead lined frames, drilled for 9 mm (3/8 inch) floor bolts.

c. Where mullions occur, provide 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two 6 mm (1/4 inch) floor bolts and frame anchor screws.

d. Where sill sections occur, provide continuous 1 mm (0.042 inch) thick steel rough bucks drilled for 6 mm (1/4 inch) floor bolts and frame anchor screws. Space floor bolts at 50 mm (24 inches) on center.

2. Jamb anchors:

a. Locate anchors on jambs near top and bottom of each frame, and at intermediate points not over 600 mm (24 inches) apart, except for fire rated frames space anchors as required by labeling authority.

b. Form jamb anchors of not less than 1 mm (0.042 inch) thick steel unless otherwise specified.

c. Anchors set in masonry: Use adjustable anchors designed for friction fit against the frame and for extension into the masonry not less than 250 mm (10 inches). Use one of following type:

1) Wire loop type of 5 mm (3/16 inch) diameter wire.

2) T-shape or strap and stirrup type of corrugated or perforated sheet steel.

d. Anchors for stud partitions: Either weld to frame or use lock-in snap-in type. Provide tabs for securing anchor to the sides of the studs.

e. Anchors for observation windows and other continuous frames set in stud partitions.

1) In addition to jamb anchors, weld clip anchors to sills and heads of continuous frames over 1200 mm (4 feet) long.
2) Anchors spaced 600 mm (24 inches) on centers maximum.

f. Modify frame anchors to fit special frame and wall construction and provide special anchors where shown or required.

2.5 SHOP PAINTING

SDI A250.8.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Plumb, align and brace frames securely until permanent anchors are set.
   1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
   2. Use wood spreaders at bottom of frame if the shipping spreader is removed.
   3. Protect frame from accidental abuse.
   4. Where construction will permit concealment, leave the shipping spreaders in place after installation, otherwise remove the spreaders after the frames are set and anchored.
   5. Remove wood spreaders and braces only after the walls are built and jamb anchors are secured.

B. Floor Anchors:
   1. Anchor the bottom of door frames to floor with two 6 mm (1/4 inch) diameter expansion bolts. Use 9 mm (3/8 inch) bolts on lead lined frames.
   2. Power actuated drive pins may be used to secure frame anchors to concrete floors.

C. Jamb Anchors:
   1. Anchors in masonry walls: Embed anchors in mortar. Fill space between frame and masonry wall with grout or mortar as walls are built.
   2. Coat frame back with a bituminous coating prior to lining of grout filling in masonry walls.
   3. Secure anchors to sides of studs with two fasteners through anchor tabs. Use steel drill screws to steel studs.

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

E. Frames for Sound Rated Doors: Coordinate to line frames for sound rated doors with insulation.

3.2 INSTALLATION OF DOORS AND APPLICATION OF HARDWARE

Install doors and hardware as specified in this Section, 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 fire rated 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: Section 08 80 00, GLAZING.

E. Finish: Section 09 06 00, SCHEDULE FOR FINISHES.

F. Card readers and biometric devices: By Owner

G. Pre-wire for electric strikes in metal frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES

1.3 SUBMITTALS

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

B. Samples:

1. Corner section of flush veneered door 300 mm (12 inches) square, showing details of construction, labeled to show grade and type number and conformance to specified standard.
2. Veneer sample 200 mm (8 inch) by 275 mm (11 inch) by 6 mm (1/4 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is accepted.

C. Shop Drawings:

1. Show every door in project and schedule location in building.
2. Indicate type, grade, finish and size; include detail of glazing and pertinent details.
3. Provide information concerning specific requirements not included in the manufacturer's literature and data submittal.

D. Manufacturer's Literature and Data:

1. Sound rated doors, including test report indicating STC rating per ASTM E90 from test laboratory.
2. Labeled fire rated doors showing conformance with NFPA 80.

E. Laboratory Test Reports:

1. Screw holding capacity test report in accordance with WDMA T.M.10.
2. Split resistance test report in accordance with WDMA T.M.5.
3. Cycle/Slam test report in accordance with WDMA T.M.7.
4. Hinge-Loading test report in accordance with WDMA T.M.8.

1.4 WARRANTY

A. Doors are subject to terms of Article titled "Warranty of Construction", FAR clause 52.246-21, except that warranty shall be as follows:

1. For interior doors, manufacturer's warranty for lifetime of original installation.

1.5 DELIVERY AND STORAGE

A. Factory seal doors and accessories in minimum of 6 mill polyethylene bags or cardboard packages which shall remain unbroken during delivery and storage.

B. Store in accordance with WDMA I.S.1-A, J-1 Job Site Information.

C. Label package for door opening where used.

1.6 APPLICABLE PUBLICATIONS

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

B. Window and Door Manufacturers Association (WDMA):

I.S.1-A-04.....Architectural Wood Flush Doors
I.S.4-07A.....Water-Repellent Preservative Non-Pressure Treatment for Millwork
T.M.5-90.....Split Resistance Test Method
T.M.6-08.....Adhesive (Glue Bond) Durability Test Method
T.M.7-08.....Cycle-Slam Test Method
T.M.8-08.....Hinge Loading Test Method
T.M.10-08.....Screwholding Test Method

C. National Fire Protection Association (NFPA):

80-07.....Protection of Buildings from Exterior Fire
252-08.....Fire Tests of Door Assemblies

D. ASTM International (ASTM):

E90-04.....Laboratory Measurements of Airborne Sound Transmission Loss

PART 2 - PRODUCTS

2.1 FLUSH DOORS

A. General:
   1. Meet requirements of WDMA I.S.1-A, Extra Heavy Duty.
   2. Adhesive: Type II
   3. Thickness: 45 mm (1-3/4 inches) unless otherwise shown or specified.

B. Face Veneer:
   1. In accordance with WDMA I.S.1-A.
   2. One species throughout the project unless scheduled or otherwise shown.
   3. For transparent finishes: Premium Grade.
      a. In existing buildings, where doors are required to have transparent finish, use wood species and grade of face veneers to match adjacent existing doors.
      b. Door edges shall be same species as door face veneer except maple may be used for stile face veneer on birch doors.
   4. For painted finishes: Custom Grade, mill option close grained hardwood, premium or medium density overlay. Do not use Lauan.
   5. Factory sand doors for finishing.

C. Wood for stops of glazed flush doors required to have transparent finish:
   1. Solid Wood of same species as face veneer, except maple may be used on birch doors.
   2. Glazing:
      a. On non-labeled doors use applied wood stops nailed tight on room side and attached on opposite side with flathead, countersunk wood screws, spaced approximately 125 mm (5 inches) on centers.
      b. Use stainless steel or dull chrome plated brass screws for exterior doors.

E. Fire rated wood doors:
   1. Fire Performance Rating:
      a. “B” label, 1-1/2 hours.
      b. “C” label, 3/4 hour.
   2. Labels:

a. Doors shall conform to the requirements of ASTM E2074, or NFPA 252, and, carry an identifying label from a qualified testing and inspection agency for class of door or opening shown designating fire performance rating.
b. Metal labels with raised or incised markings.

3. Performance Criteria for Stiles of doors utilizing standard mortise leaf hinges:
   a. Hinge Loading: WDMA T.M.8. Average of 10 test samples for Extra Heavy Duty doors.
   b. Direct screw withdrawal: WDMA T.M.10 for Extra Heavy Duty doors. Average of 10 test samples using a steel, fully threaded #12 wood screw.
   c. Cycle Slam: 1,000,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with WDMA T.M.7.
4. Additional Hardware Reinforcement:
   a. Provide fire rated doors with hardware reinforcement blocking.
   b. Size of lock blocks as required to secure hardware specified.
   c. Top, bottom and intermediate rail blocks shall measure not less than 125 mm (five inches) minimum by full core width.
   d. Reinforcement blocking in compliance with manufacturer's labeling requirements.
   e. Mineral material similar to core is not acceptable.
5. Other Core Components: Manufacturer's standard as allowed by the labeling requirements.
6. Provide steel frame approved for use in labeled doors for vision panels.
7. Provide steel astragal on pair of doors.

2.2 PREFINISH, PREFIT

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.

2.3 IDENTIFICATION MARK:

A. On top edge of door.

B. Either a stamp, brand or other indelible mark, giving manufacturer's name, door's trade name, construction of door, code date of manufacture and quality.

C. Accompanied by either of the following additional requirements:

1. An identification mark or a separate certification including name of inspection organization.
2. Identification of standards for door, including glue type.
3. Identification of veneer and quality certification.
4. Identification of preservative treatment for stile and rail doors.

2.4 SEALING:

Give top and bottom edge of doors two coats of catalyzed polyurethane or water resistant sealer before sealing in shipping containers.

PART 3 - EXECUTION

3.1 DOOR PREPARATION

A. Field, shop or factory preparation: Do not violate the qualified testing and inspection agency label requirements for fire rated doors.

B. Clearances between Doors and Frames and Floors:

1. Maximum 3 mm (1/8 inch) clearance at the jambs, heads, and meeting stiles, and a 19 mm (3/4 inch) clearance at bottom, except as otherwise specified.
2. Maximum clearance at bottom of sound rated doors, light-proofed doors, doors to operating rooms, and doors designated to be fitted with mechanical seal: 10 mm (3/8 inch).

C. Provide cutouts for special details required and specified.

D. Rout doors for hardware using templates and location heights specified in Section, 08 71 00 DOOR HARDWARE.

E. Fit doors to frame, bevel lock edge of doors 3 mm (1/8 inch) for each 50 mm (two inches) of door thickness undercut where shown.

F. Immediately after fitting and cutting of doors for hardware, seal cut edges of doors with two coats of water resistant sealer.

G. Finish surfaces, including both faces, top and bottom and edges of the doors smooth to touch.

H. Apply a steel astragal on the opposite side of active door on pairs of fire rated doors.

I. Apply a steel astragal to meeting style of active leaf of pair of doors or double egress smoke doors.

3.2 INSTALLATION OF DOORS APPLICATION OF HARDWARE

Install doors and hardware as specified in this Section.

3.3 DOOR PROTECTION

A. As door installation is completed, place polyethylene bag or cardboard shipping container over door and tape in place.

B. Provide protective covering over knobs and handles in addition to covering door.

C. Maintain covering in good condition until removal is approved by Resident Engineer.

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SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION:

Section specifies access doors or panels.

1.2 RELATED WORK:

A. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.

B. Access doors in acoustical ceilings: Section 09 51 00, ACOUSTICAL CEILINGS.

C. Locations of access doors for duct work cleanouts: Section 23 31 00, HVAC DUCTS AND CASINGS // Section 23 37 00, AIR OUTLETS AND INLETS.

1.3 SUBMITTALS:

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

B. Shop Drawings: Access doors, each type, showing construction, location and installation details.

C. Manufacturer's Literature and Data: Access doors, each type.

1.4 APPLICABLE PUBLICATIONS

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

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

A167-99(R-2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

A1008-10.....Steel Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy

C. American Welding Society (AWS):

D1.3-08.....Structural Welding Code Sheet Steel

D. National Fire Protection Association (NFPA):

80-10.....Fire Doors and Windows

E. The National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series.....Metal Finishes Manual

F. Underwriters Laboratories, Inc. (UL):

Fire Resistance Directory

PART 2 - PRODUCTS

2.1 FABRICATION, GENERAL

A. Fabricate components to be straight, square, flat and in same plane where required.
   1. Slightly round exposed edges and without burrs, snags and sharp edges.
   2. Exposed welds continuous and ground smooth.
   3. Weld in accordance with AWS D1.3.
B. Number of locks and non-continuous hinges as required to maintain alignment of panel with frame. For fire rated doors, use hinges and locks as required by fire test.
C. Provide anchors or make provisions in frame for anchoring to adjacent construction. Provide size, number and location of anchors on four sides to secure access door in opening. Provide anchors as required by fire test.

2.2 ACCESS DOORS, FIRE RATED:

A. Shall meet requirements for "B" label 1-1/2 hours with maximum temperature rise of 120 degree C (250 degrees F).
B. Comply with NFPA 80 and have Underwriters Laboratories Inc., or other nationally recognized laboratory label for Class B opening.
C. Door Panel: Form of 0.9 mm (0.0359 inch) thick steel sheet, insulated sandwich type construction.
D. Frame: Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed. Provide frame flange at perimeter where installed in concrete masonry or gypsum board openings.
   1. Weld exposed joints in flange and grind smooth.
   2. Provide frame flange at perimeter where installed in concrete masonry or gypsum board.
E. Automatic Closing Device: Provide automatic closing device for door.
F. Hinge: Continuous steel hinge with stainless steel pin.
G. Lock:
   1. Self-latching, with provision for fitting flush a standard screw-in type lock cylinder. Lock cylinder specified in Section 08 71 00, DOOR HARDWARE.
   2. Provide latch release device operable from inside of door. Mortise case in door.

2.3 ACCESS DOORS, FLUSH PANEL:

A. Door Panel:

1. Form of 1.9 mm (0.0747 inch) thick steel sheet.
2. Reinforce to maintain flat surface.

B. Frame:
1. Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed.
2. Provide surface mounted units having frame flange at perimeter where installed in concrete, masonry, or gypsum board construction.
3. Weld exposed joints in flange and grind smooth.

C. Hinge:
1. Concealed spring hinge to allow panel to open 175 degrees.
2. Provide removable hinge pin to allow removal of panel from frame.

D. Lock:
1. Flush, screwdriver operated cam lock.

2.5 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:

Minimum 600 mm (24 inches) square door unless otherwise shown or required to suit access conditions.

PART 3 - EXECUTION

3.1 LOCATION:

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

3.2 INSTALLATION, GENERAL:

A. Install access doors in openings to have sides vertical in wall installations, and parallel to ceiling suspension grid or side walls when installed in ceiling.
B. Set frames so that edge of frames without flanges will finish flush with surrounding finish surfaces.

C. Set frames with flanges to overlap opening and so that face will be uniformly spaced from the finish surface.

3.3 ANCHORAGE:

A. Secure frames to adjacent construction using anchors attached to frames or by use of bolts or screws through the frame members.

B. Type, size and number of anchoring device suitable for the material surrounding the opening, maintain alignment, and resist displacement during normal use of access door.

C. Anchors for fire rated access doors shall meet requirements of applicable fire test.

3.4 ADJUSTMENT:

A. Adjust hardware so that door panel will open freely.

B. Adjust door when closed so door panel is centered in the frame.

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SECTION 08 33 00
COILING DOORS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies coiling door complete as specified.

1.2 RELATED WORK

A. Lock cylinders for cylindrical locks: Section 08 71 00, DOOR HARDWARE.

B. Field painting: Section 09 91 00, PAINTING.

C. Electric devices and wiring: DIVISION 26, ELECTRICAL.

1.3 MANUFACTURER'S AND INSTALLER'S QUALIFICATIONS

A. Coiling door shall be products of manufacturers regularly engaged in manufacturing items of type specified. Basis-of Design coiling door is:

Overhead Door Corp.
2501 S. State Hwy, 121, Suite 200
Lewisville, TX 75067
Toll free: (800) 275-3290
Web site: www.overheaddoor.com

B. Install items under direct supervision of manufacturer's representative or trained personnel.

1.5 SUBMITTALS

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

B. Shop Drawings:

1. Each type of door showing details of construction, accessories and hardware, electrical and mechanical items supporting brackets for motors, location, and ratings of motors, and safety devices.
2. Wiring diagrams for motors and controls, including wiring diagram for door showing electrical interlock of motor with manually operated dead lock, electrical rough-in.

C. Manufacturer's Literature and Data:

1. Brochures or catalog cuts.
2. Manufacturer's installation procedures and instructions.
3. Maintenance instructions, parts lists.

D. Certificates:

1. Attesting doors, anchors and hardware will withstand the horizontal loads specified.

1.6 APPLICABLE PUBLICATIONS

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

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

A36/A36M-08 .....Structural Steel

A167-99(R2009) .....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

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

B209/209M-07 .....Aluminum and Aluminum-Alloy Sheet and Plate

B221/B221M-08 .....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

C. National Electrical Manufacturers Association (NEMA):

ICS 1-00(R2008) .....Industrial Control and Systems General Requirements

ICS 2-00(R2005) .....Industrial Control, and Systems, Controllers, Contactors, and Overload Relays

ICS 6-93 (R2006) .....Industrial Control and Systems Enclosures

MG 1-10 .....Motors and Generators

ST 20-92 (R1997) .....Dry-Type Transformers for General Applications

D. Master Painters Institute (MPI):

MPI #35 .....Exterior Bituminous Coating

MPI #76 .....Quick Drying Alkyd Metal Primer

E. National Fire Protection Association (NFPA):

70-11 .....National Electrical Code 1999 Edition

80-10 .....Fire Doors and Fire Windows

F. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series .....Metal Finishes Manual

G. Underwriters Laboratories, Inc. (UL):

2010 .....Fire Resistance Directory

PART 2 - PRODUCTS

2.1 MATERIAL

A. Steel: A653 for forming operation. ASTM A36 for structural sections.

B. Stainless Steel: ASTM A167, Type 302 or 304.

C. Aluminum, Plate and Sheet: ASTM B209/B209M

D. Aluminum, Extruded: ASTM B221/B221M

E. Alkyd Metal Primer: MPI No. 76.

F. Bituminous Coating: MPI No. 35.

2.2 DESIGN REQUIREMENTS

A. Basis-of-Design: Overhead Door Corp. Stormtight AP series 627 Coil-Away Service door shall be spring counter balanced, overhead coiling type, inside face mounted with guides at jambs set back a sufficient distance to provide a clear opening when door is in open position.

B. Doors, hardware, and anchors shall be designed to withstand a horizontal or wind/pressure of 958 Pa (20/psf) of door area without damage.

C. Operation: Design door assembly, including operator, to operate for not less that 20,000 cycles.

D. All motor operators shall have manual emergency mechanical operators.

2.3 FABRICATION

A. Curtains:

1. Form of interlocking slats of galvanized steel of shapes standard with the manufacturer, except that slats for exterior doors shall be flat type.

2. Thickness of slats shall be as required to resist loads specified except not less than the following:
   a. For doors less than 4500 mm (15 feet) wide: 0.75 mm (0.0299 inch).

B. Endlocks and Windlocks:
   1. Manufacturer's stock design of galvanized malleable iron or galvanized steel or stamped cadmium steel for doors.
   2. The ends of each slat for exterior doors and each alternate slat for interior doors shall have endlocks.
   3. Doors shall have windlocks at ends of at least every sixth slat. Windlocks shall prevent curtain from leaving guide because of deflection from wind pressure or other forces.

C. Bottom Bar:
   1. Two angles of equal weight, one on each side, standard extruded aluminum members not less than 3 mm (0.125 inch) thick.
   2. Bottom bar designed to receive weather-stripping and safety device, and be securely fastened to bottom of curtain or grille.

D. Barrel and Spring Counterbalance:
   1. Curtain shall coil on a barrel supported at end of opening on brackets and be balanced by helical springs.
   2. Barrel fabricated of steel pipe or commercial welded steel tubing of proper diameter and thickness for the size of curtain, to limit deflection with curtain rolled up, not to exceed 1 in 400 (0.03 inch per foot) of span.
   3. Close ends of barrel with cast iron plugs, machined to fit the opening.
   4. Within the barrel, install an oil-tempered, helical, counter balancing steel spring, capable of producing sufficient torque to assure easy operation of the door curtain from any position.
   5. At least 80 percent of the door weight shall be counter balanced at any position.

6. Spring-tension shall be adjustable from outside of bracket without removing the hood or motor operator.

E. Brackets:

1. Steel plate designed to form end closure and support for hood and the end of the barrel assembly.
2. End of barrel or shaft shall screw into bracket hubs fabricated of cast iron or steel.
3. Equip bracket hubs or barrel plugs with prelubricated ball bearings, shielded or sealed.

F. Hoods:

1. Galvanized, not less than24 gauge.
2. Form hood to fit contour of end brackets.
3. Reinforce at top and bottom edges with rolled beads, rods or angles. Hoods more than 3600 mm (12 feet) in length shall have intermediate supporting brackets.
4. Fasten to brackets with screws or bolts and provide for attachment to wall with bolts.
5. Provide a weather baffle at the lintel or inside the hood of each exterior door to minimize seepage of air through the hood enclosure.

G. Guides:

1. Manufacturer's standard formed sections or angles of steel.
   a. Steel sections not less than 5 mm (3/16 inch) thick.
2. Form a channel pocket of sufficient depth to retain the curtain in place under the horizontal pressure specified, and prevent ends of curtain from slipping out of guide slots.
3. Top sections flared for smooth entry of curtain to vertical sections that will facilitate entry of curtain.
4. Provide stops to limit curtain travel above top of guides.
5. Provide guide of aluminum with replaceable wear strips to prevent metal to metal contact.
6. Mounting brackets shall provide closure between guides and jambs.

H. Weather-stripping:

1. Manually Operated Doors: Exterior doors shall have a compressible and replaceable rubber, neoprene, or vinyl weather seal attached to bottom bar.
2. Motor Operated Doors: Bottom bar safety device shall be a combination compressible seal and safety device as specified in paragraph, ELECTRIC MOTOR OPERATORS.
3. At exterior doors provide replaceable sweep type continuous vinyl or neoprene weather seals on guides and across head on exterior to seal against wind infiltration.

I. Locking:

1. Cylinder locks shall receive standard screw in cylinders furnished under Section, 08 71 00 DOOR HARDWARE.
2. For motor operated doors provide manufacturer's standard cylinder dead lock type locking device on the inside, key operated from both sides, interlocked with motor to prevent motor from operating when locks are activated.

2.5 MANUAL OPERATORS

B. Hand Chain Operation:

1. Galvanized, endless chain operating over a sprocket and extending to within 900 mm (3 feet) of floor.
2. Obtain reduction by use of suitable permanently lubricated gearing connected by roller chain and sprocket drive.
3. Calculate gear reduction to reduce pull required on hand chain, not to exceed 1676 Pa (35 psf).

2.6 FINISHES

A. Steel:

1. Clean surfaces of steel free from scale, rust, oil and grease, and then apply a .02 mils baked on primer and premium powder coat finish coat, color as selected by the Engineer from the Premium color chart.
2. Non-galvanized steel: Apply rust inhibitive primer on exposed ferrous surfaces.
3. Minimum 5 year finish warranty against fading and failure of the paint system (cracking, flaking, peeling, blistering, etc.)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install doors in accordance with approved shop drawings and manufacturer's instructions.

B. Locate anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories accurately.

C. Securely attach guides to adjoining construction with not less than 9 mm (3/8 inch) diameter bolts, near each end and spaced not over 600 mm (24 inches) apart.

D. Locate control switches where shown.

E. Install all electric devices and wiring as specified in DIVISION 26 ELECTRICAL and DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

3.2 REPAIR

A. Repair prime painted zinc-coated surfaces and bare zinc-coated surfaces that are damaged by the application of galvanizing repair compound. Spot prime all damaged shop prime painted surfaces including repaired prime painted zinc-coated surfaces.

B. Coiling Doors shall be lubricated, properly adjusted, and demonstrated to operate freely.

3.3 INSPECTION

Upon completion, doors shall be weathertight and doors shall be free from warp, twist, or distortion.

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SECTION 08 41 13
SLIDING ALUMINUM DOORS

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies glazed aluminum door systems including interior ICU/CCU sliding doors, and other components to make a complete assembly.

1.2 RELATED WORK:

A. Glass and Glazing: Section 08 80 00, GLAZING.

B. Hardware: Section 08 71 00, DOOR HARDWARE.

C. Automatic Door Operators: Section 08 71 13, AUTOMATIC DOOR OPERATORS.

1.3 SUBMITTALS:

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

B. Shop Drawings: (1/2 full scale) showing construction, anchorage, reinforcement, and installation details.

C. Manufacturer’s Literature and Data:

1. Doors, each type.
2. Entrance and Storefront construction.

D. Samples:

1. Door corner section, 450 mm x 450 mm (18 x 18 inches), of each door type specified, showing vertical and top hinge edges, door closer reinforcement and internal reinforcement.
2. Two samples of anodized aluminum of each color showing finish and maximum shade range.

E. Manufacturer's Certificates:

1. Stating that aluminum has been given specified thickness of anodizing.
2. Indicating manufacturer's qualifications specified.

1.4 QUALITY ASSURANCE:

A. Approval by Contracting Officer is required of products of proposed manufacturer, or supplier, and will be based upon submission by Contractor certification.

B. Certify manufacturer regularly and presently manufactures aluminum entrances as one of their principal products.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver aluminum entrance and storefront material to the site in packages or containers; labeled for identification with the manufacturer's name, brand and contents.

B. Store aluminum entrance and storefront material in weather-tight and dry storage facility.

C. Protect from damage from handling, weather and construction operations before, during and after installation.

1.6 APPLICABLE PUBLICATIONS:

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

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

B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate

B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

E283-04.....Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

E331-00(R2009).....Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

F468-10.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

F593-02(R2008).....Stainless Steel Bolts, Hex Cap Screws, and Studs

C. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series.....Metal Finishes Manual

D. American Architectural Manufacturer's Association (AAMA):

2604-10.....High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels

E. American Welding Society (AWS):

D1.2-08.....Structural Welding Code Aluminum

PART 2 - PRODUCTS

2.1 Basis of Design for ICC/CCU Entrances:

A. Manufacturer and model; Stanley Access Technologies: Dura-Glide 7000TL Series manual sliding ICU/CCU entrances.

1. Requirements:
   a. Configuration: One sliding panel and one sidelight.
   b. Traffic pattern: Two-Way
   c: Breakaway Capability: Sliding panels and sidelights.
   d. Mounting: Between jambs
   e. Track: None, trackless. See thresholds.

2.1 MATERIALS:

A. Aluminum, ASTM B209 and B221:
   1. Alloy ASTM B221 Extruded bars, rods, profiles and tubes:
   2. Alloy 6061 temper T6 for headers, stiles, rails and frames
   3. Sheet and plate: ASTM B209

B. Fasteners:
   1. Aluminum: ASTM F468, Alloy 2024.
   2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.

2.2 FABRICATION:

A. Fabricate doors, of extruded aluminum sections not less than 3 mm (0.125 inch) thick. Fabricate glazing beads of aluminum not less than 1.0 mm (0.050 inch) thick.

B. Accurately form metal parts and accurately fit and rigidly assemble joints, except those joints designed to accommodate movement. Seal joints to prevent leakage of both air and water.

C. Make welds in aluminum in accordance with the recommended practice AWA D1.2. Use electrodes and methods recommended by the manufacturers of the metals and alloys being welded. Make welds behind finished surfaces so as to cause no distortion or discoloration of the exposed side. Clean welded joints of welding flux and dress exposed and contact surfaces.

D. Make provisions in doors and frames to receive the specified hardware and accessories. Coordinate schedule and template for hardware specified under Section 08 71 00, DOOR HARDWARE. Where concealed closers or other mechanisms are required, provide the necessary space, cutouts, and reinforcement for secure fastening.

E. Fit and assemble the work at the manufacturer's plant. Mark work that cannot be permanently plant-assembled to assure proper assembly in the field.

2.3 PROTECTION OF ALUMINUM:

A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by any of the following:
   1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint.
   2. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
   3. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

2.4 FRAMES:

A. Fabricate frame members from manufacturer’s standard extruded aluminum sections 1-3/4” x 4 1/2” and 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.

2.5 STILE AND RAIL DOORS AND SIDELIGHTS:

A. Fabricate doors and sidelights of manufacturer’s standard 2” narrow stile 51 mm (2” inch) section and bottom rail 102 mm (4 inches) wide.
B. Sliding weather-stripping: Manufacturer’s standard replaceable components complying with AAMA 701; vinyl or rubber.

2.6 REINFORCEMENT FOR BUILDERS HARDWARE:

A. Fabricate from stainless steel plates.
B. Hinge and pivot reinforcing: 4.55 mm (0.1793 inch) thick.
C. Reinforcing for lock face, flush bolts, concealed holders, concealed or surface mounted closers: 2.66 mm (0.1046 inch) thick.
D. Reinforcing for all other surface mounted hardware: 1.5 mm (0.0598 inch) thick.

2.7 FINISH

A. In accordance with NAAMM AMP 500 series.
B. Anodized Aluminum:
   1. Clear Finish: Class II, Clear Anodic Finish: AA-M12C22A31 Mechanical Finish: as fabricated: Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.40 mils minimum omplyiong with AAMA 611-98, and the following:
      a. AAMA 607.1

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Allowable Installation Tolerances: Install work plumb and true, in alignment and in relation to lines and grades shown. Variation of 3 mm (1/8 inch) in 2400 mm (eight feet), non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.

B. Anchor aluminum frames to adjoining construction at heads, jambs and bottom and to steel supports, and bracing. Anchor frames with stainless steel or aluminum countersunk flathead, expansion bolts or machine screws, as applicable. Use aluminum clips for internal connections of adjoining frame sections.

C. Where work is installed within masonry or concrete openings, place no parts other than built-in anchors and provision for operating devices located in the floor, until after the masonry or concrete work is completed.

D. Install glazing under Section 08 80 00.

D. Install hardware specified under Section 08 71 00, DOOR HARDWARE.

E. Install hung door operators specified under Section 08 71 13, AUTOMATIC DOOR OPERATORS.

3.2 ADJUSTING:

After installation of entrance and storefront work is completed, adjust and lubricate operating mechanisms to insure proper performance.

3.3 PROTECTION, CLEANING AND REPAIRING:

Remove all mastic smears and other unsightly marks, and repair any damaged or disfiguration of the work. Protect the installed work against damage or abuse.

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SECTION 08 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 14 00, WOOD DOORS // Section 08 11 13, HOLLOW METAL DOORS AND FRAMES Section 08 41 13, SLIDING ALUMINUM DOORS INTENSIVE CARE UNIT/CRITICAL CARE UNIT (ICU/CCU) ENTRANCES // Section 08 42 29, AUTOMATIC ENTRANCES // Section 08 71 13, AUTOMATIC DOOR OPERATORS

C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.

D. Painting: Section 09 91 00, PAINTING.

E. Card Readers: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.

F. Electrical: Division 26, ELECTRICAL.

G. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

1.3 GENERAL

A. All hardware shall comply with UFAS, (Uniform Federal Accessible Standards) unless specified otherwise.

B. Provide rated door hardware assemblies where required by most current version of the International Building Code (IBC).

C. Hardware for Labeled Fire Doors and Exit Doors: Conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, large size, or better grades are specified herein under paragraph HARDWARE SETS. In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements.

D. Hardware for application on metal and wood doors and frames shall be made to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.

E. The following items shall be of the same manufacturer, if possible, except as otherwise specified:

1. Mortise locksets.

2. Hinges for hollow metal and wood doors.
3. Surface applied overhead door closers.
4. Exit devices.
5. Floor closers.

1.4 WARRANTY

A. Automatic door operators shall be subject to the terms of FAR Clause 52.24-21, except that the Warranty period shall be two years in lieu of one year for all items except as noted below:
   1. Locks, latchsets, and panic hardware: 5 years.
   2. Door closers and continuous hinges: 10 years.

1.5 MAINTENANCE MANUALS

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

1.6 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23 plus 2 copies to the VAMC Locksmith (VISN Locksmith if the VAMC does not have a locksmith).

B. Hardware Schedule: Prepare and submit hardware schedule in the following form:

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 preinstallation meeting not less than 30 days before start of installation of door hardware. Require attendance of parties directly affecting work of this section, including Contractor and Installer, Architect, Project Engineer and VA Locksmith, Hardware Consultant, and Hardware Manufacturer’s Representative. Review the following:

1. Inspection of door hardware.
2. Job and surface readiness.
3. Coordination with other work.
4. Protection of hardware surfaces.
5. Substrate surface protection.
6. Installation.
7. Adjusting.
8. Repair.
9. Field quality control.
10. Cleaning.

1.9 INSTRUCTIONS

A. Hardware Set Symbols on Drawings: Except for protective plates, door stops, mutes, thresholds and the like specified herein, hardware requirements for each door are indicated on drawings by symbols.

Symbols for hardware sets consist of letters (e.g., "HW") followed by a number. Each number designates a set of hardware items applicable to a door type.

B. Manufacturers' Catalog Number References: Where manufacturers' products are specified herein, products of other manufacturers which are considered equivalent to those specified may be used. Manufacturers whose products are specified are identified by abbreviations as follows:

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

C. Keying: All cylinders shall be keyed into existing Best Cormax Great Grand Master Key System. Provide removable core cylinders that are removable only with a special key or tool without disassembly of knob or lockset. Cylinders shall be 7 pin type. Keying information shall be furnished at a later date by the Resident Engineer.

1.10 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. In text, hardware items are referred to by series, types, etc., listed in such specifications and standards, except as otherwise specified.

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

F883-04.....Padlocks

E2180-07.....Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials

C. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):

A156.1-06.....Butts and Hinges

A156.2-03.....Bored and Pre-assembled Locks and Latches

A156.3-08.....Exit Devices, Coordinators, and Auto Flush Bolts

A156.4-08.....Door Controls (Closers)

A156.5-01.....Auxiliary Locks and Associated Products

A156.6-05.....Architectural Door Trim

A156.8-05.....Door Controls-Overhead Stops and Holders

A156.12-05 .....Interconnected Locks and Latches

A156.13-05.....Mortise Locks and Latches Series 1000

A156.14-07 .....Sliding and Folding Door Hardware

A156.15-06.....Release Devices-Closer Holder, Electromagnetic and Electromechanical

A156.16-08.....Auxiliary Hardware

A156.17-04 .....Self-Closing Hinges and Pivots

A156.18-06.....Materials and Finishes

A156.20-06 .....Strap and Tee Hinges, and Hasps

A156.21-09.....Thresholds

A156.22-05.....Door Gasketing and Edge Seal Systems

A156.23-04.....Electromagnetic Locks

A156.24-03.....Delayed Egress Locking Systems

A156.25-07 .....Electrified Locking Devices

A156.26-06.....Continuous Hinges

A156.28-07 .....Master Keying Systems

A156.29-07 .....Exit Locks and Alarms

A156.30-03 .....High Security Cylinders

A156.31-07 .....Electric Strikes and Frame Mounted Actuators

A250.8-03.....Standard Steel Doors and Frames

D. National Fire Protection Association (NFPA):

80-10.....Fire Doors and Fire Windows

101-09.....Life Safety Code

E. Underwriters Laboratories, Inc. (UL):
Building Materials Directory (2008)

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. ANSI A156.1. Provide only three-knuckle hinges, except five-knuckle where the required hinge type is not available in a three-knuckle version (e.g., some types of swing-clear hinges). The following types of butt hinges shall be used for the types of doors listed, except where otherwise specified:
   1. Exterior Doors: Type A2112/A5112 for doors 900 mm (3 feet) wide or less and Type A2111/A5111 for doors over 900 mm (3 feet) wide. Hinges for exterior outswing doors shall have non-removable pins. Hinges for exterior fire-rated doors shall be of stainless steel material.
   2. Interior Doors: Type A8112/A5112 for doors 900 mm (3 feet) wide or less and Type A8111/A5111 for doors over 900 mm (3 feet) wide. Hinges for doors exposed to high humidity areas (shower rooms, toilet rooms, kitchens, janitor rooms, etc. shall be of stainless steel material.

B. Provide quantity and size of hinges per door leaf as follows:
   1. Doors up to 1210 mm (4 feet) high: 2 hinges.
   2. Doors 1210 mm (4 feet) to 2260 mm (7 feet 5 inches) high: 3 hinges minimum.
   3. Doors greater than 2260 mm (7 feet 5 inches) high: 4 hinges.
   4. Doors up to 900 mm (3 feet) wide, standard weight: 114 mm x 114 mm (4-1/2 inches x 4-1/2 inches) hinges.
   5. Doors over 900 mm (3 feet) to 1065 mm (3 feet 6 inches) wide, standard weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
   6. Doors over 1065 mm (3 feet 6 inches) to 1210 mm (4 feet), heavy weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
   7. Provide heavy-weight hinges where specified.
   8. At doors weighing 330 kg (150 lbs.) or more, furnish 127 mm (5 inch) high hinges.

C. See Articles "MISCELLANEOUS HARDWARE" and "HARDWARE SETS" for pivots and hinges other than butts specified above and continuous hinges specified below.

2.3 DOOR CLOSING DEVICES

A. Closing devices shall be products of one manufacturer // for each type specified. //

2.4 OVERHEAD CLOSERS

A. Conform to ANSI A156.4, Grade 1.

B. Closers shall conform to the following:

1. The closer shall have minimum 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back check effective between 60 degrees and 85 degrees of door opening.
2. Where specified, closer shall have hold-open feature.
3. Size Requirements: Provide multi-size closers, sizes 1 through 6, except where multi-size closer is not available for the required application.
4. Material of closer body shall be forged or cast.
5. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.
6. Where closers are exposed to the exterior or are mounted in rooms that experience high humidity, provide closer body and arm assembly of stainless steel material.
7. Closers shall have full size metal cover; plastic covers will not be accepted.
8. Closers shall have adjustable hydraulic back-check, separate valves for closing and latching speed, adjustable back-check positioning valve, and adjustable delayed action valve.
9. Provide closers with any accessories required for the mounting application, including (but not limited to) drop plates, special soffit plates, spacers for heavy-duty parallel arm fifth screws, bull-nose or other regular arm brackets, longer or shorter arm assemblies, and special factory templating. Provide special arms, drop plates, and templating as needed to allow mounting at doors with overhead stops and/or holders.
10. Closer arms or backcheck valve shall not be used to stop the door from overswing, except in applications where a separate wall, floor, or overhead stop cannot be used.
11. Provide parallel arm closers with heavy duty rigid arm.

12. Where closers are to be installed on the push side of the door, provide parallel arm type except where conditions require use of top jamb arm.
13. Provide all surface closers with the same body attachment screw pattern for ease of replacement and maintenance.
14. All closers shall have a 1 ½" (38mm) minimum piston diameter.

2.6 DOOR STOPS

A. Conform to ANSI A156.16.
B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For concrete, masonry or quarry tile construction, use lead expansion shields for mounting door stops.
C. Where cylindrical locks with turn pieces or pushbuttons occur, equip wall bumpers Type L02251 (rubber pads having concave face) to receive turn piece or button.
D. Provide floor stops (Type L02141 or L02161 in office areas; Type L02121 x 3 screws into floor elsewhere. Wall bumpers, where used, must be installed to impact the trim or the door within the leading half of its width. Floor stops, where used, must be installed within 4-inches of the wall face and impact the door within the leading half of its width.
E. Where drywall partitions occur, use floor stops, Type L02141 or L02161 in office areas, Type L02121 elsewhere.
G. Omit stops where floor mounted door holders are required and where automatic operated doors occur.
H. Provide appropriate roller bumper for each set of doors (except where closet doors occur) where two doors would interfere with each other in swinging.
I. Provide appropriate door mounted stop on doors in individual toilets where floor or wall mounted stops cannot be used.
K. Provide door stops on doors where combination closer magnetic holders are specified, except where wall stops cannot be used or where floor stops cannot be installed within 4-inches of the wall.
L. Where the specified wall or floor stop cannot be used, provide concealed overhead stops (surface-mounted where concealed cannot be used).

2.7 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.

2.8 FLOOR DOOR HOLDERS

A. Conform to ANSI Standard A156.16. Provide extension strikes for Types L01301 and L01311 holders where necessary.

2.9 LOCKS AND LATCHES

A. Conform to ANSI A156.2. Locks and latches for doors 45 mm (1-3/4 inch) thick or over shall have beveled fronts. Lock cylinders shall have not less than seven pins. Cylinders for all locksets shall be removable core type. Cylinders shall be furnished with construction removable cores and construction master keys. Cylinder shall be removable by special key or tool. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the Great Grand Master Key System. Disassembly of lever or lockset shall not be required to remove core from lockset. All locksets or latches on double doors with fire label shall have latch bolt with 19 mm (3/4 inch) throw, unless shorter throw allowed by the door manufacturer’s fire label. Provide temporary keying device or construction core of allow opening and closing during construction and prior to the installation of final cores.

B. In addition to above requirements, locks and latches shall comply with following requirements:

1. Mortise Lock and Latch Sets: Conform to ANSI/BHMA A156.13. Mortise locksets shall be series 1000, minimum Grade 2. All locksets and latchsets, except on designated doors in Psychiatric (Mental Health) areas, shall have lever handles fabricated from cast stainless steel. Provide sectional (lever x rose) lever design matching existing. No substitute lever material shall be accepted. All locks and latchsets shall be furnished with 122.55 mm (4-7/8-inch) curved lip strike and wrought box. At outswing pairs with overlapping

astragals, provide flat lip strip with 21mm (7/8-inch) lip-to-center dimension. Lock function F02 shall be furnished with emergency tools/keys for emergency entrance. All lock cases installed on lead lined doors shall be lead lined before applying final hardware finish. Furnish armored fronts for all mortise locks. Where mortise locks are installed in high-humidity locations or where exposed to the exterior on both sides of the opening, provide non-ferrous mortise lock case.

2. Cylindrical Lock and Latch Sets: levers shall meet ADA (Americans with Disabilities Act) requirements. Cylindrical locksets shall be series 4000 Grade I. All locks and latchsets shall be furnished with 122.55 mm (4-7/8-inch) curved lip strike and wrought box. At outswing pairs with overlapping astragals, provide flat lip strip with 21mm (7/8-inch) lip-to-center dimension. Provide lever design to match design selected by Architect or to match existing lever design. Where two turn pieces are specified for lock F76, turn piece on inside knob shall lock and unlock inside knob, and turn piece on outside knob shall unlock outside knob when inside knob is in the locked position. (This function is intended to allow emergency entry into these rooms without an emergency key or any special tool.)
3. Auxiliary locks shall be as specified under hardware sets and conform to ANSI A156.5.
5. Privacy locks in non-mental-health patient rooms shall have an inside thumbturn for privacy and an outside thumbturn for emergency entrance. Single occupancy patient privacy doors shall typically swing out; where such doors cannot swing out, provide center-pivoted doors with rescue hardware (see HW-2B).

2.10 PUSH-BUTTON COMBINATION LOCKS

A. ANSI/BHMA A156.13, Grade 1. Battery operated pushbutton entry.
B. Construction: Heavy duty mortise lock housing conforming to ANSI/BHMA A156.13, Grade 1. Lever handles and operating components in compliance with the UFAS and the ADA Accessibility Guidelines. Match lever handles of locks and latchsets on adjacent doors.
C. Special Features: Key override to permit a master keyed security system and a pushbutton security code activated passage feature to allow access without using the entry code.

2.11 ELECTROMAGNETIC LOCKS

A. ANSI/BHMA A156.23; electrically powered, of strength and configuration indicated; with electromagnet attached to frame and armature plate attached to door. Listed under Category E in BHMA's "Certified Product Directory."
   1. Type: Full exterior or full interior, as required by application indicated.
   2. Strength Ranking: //1500 lbf (6672 N)// //1000 lbf (4448 N)// //500 lbf (2224 N)//.
   3. Inductive Kickback Peak Voltage: Not more than //53// //0// V.
   4. Residual Magnetism: Not more than //4 lbf (18 N)// //0 lbf (0 N)// to separate door from magnet.

2.12 ELECTRIC STRIKES

A. by Owner.

B. Coordinate hardware and door frames with Owner’s electric strikes.

2.13 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

2.15 ARMOR PLATES, KICK PLATES, MOP PLATES AND DOOR EDGING

A. Conform to ANSI Standard A156.6.

B. Provide protective plates as specified below:
   1. Kick plates, mop plates and armor plates of metal, Type J100 series.
   2. Provide kick plates and mop plates where specified. Kick plates shall be 254 mm (10 inches) or 305 mm (12 inches) high. Mop plates shall be 152 mm (6 inches) high. Both kick and mop plates shall be minimum 1.27 mm (0.050 inches) thick. Provide kick and mop plates beveled on all 4 edges (B4E). On push side of doors where jamb stop

extends to floor, make kick plates 38 mm (1-1/2 inches) less than width of door, except pairs of metal doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other kick and mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick and mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.

3. Kick plates and/or mop plates are not required on following door sides:
   a. Armor plate side of doors;
   b. Exterior side of exterior doors;
   c. Closet side of closet doors;
   d. Both sides of aluminum entrance doors.
4. Armor plates for doors are listed under Article "Hardware Sets". Armor plates shall be thickness as noted in the hardware set, 875 mm (35 inches) high and 38 mm (1-1/2 inches) less than width of doors, except on pairs of metal doors. Provide armor plates beveled on all 4 edges (B4E). Plates on pairs of metal doors shall be 25 mm (1 inch) less than width of each door. Where top of intermediate rail of door is less than 875 mm (35 inches) from door bottom, extend armor plates to within 13 mm (1/2 inch) of top of intermediate rail. On doors equipped with panic devices, extend armor plates to within 13 mm (1/2 inch) of panic bolt push bar.
5. Where louver or grille occurs in lower portion of doors, substitute stretcher plate and kick plate in place of armor plate. Size of stretcher plate and kick plate shall be 254 mm (10 inches) high.
6. Provide stainless steel edge guards where so specified at wood doors. Provide mortised type instead of surface type except where door construction and/or ratings will not allow. Provide edge guards of bevel and thickness to match wood door. Provide edge guards with factory cut-outs for door hardware that must be installed through or extend through the edge guard. Provide full-height edge guards except where door rating does not allow; in such cases, provide edge guards to height of bottom of typical lockset armor front. Forward edge guards to wood door manufacturer for factory installation on doors.

2.16 EXIT DEVICES

A. Conform to ANSI Standard A156.3. Exit devices shall be Grade 1; type and function are specified in hardware sets. Provide flush with finished floor strikes for vertical rod exit devices in interior of building. Trim shall have cast satin stainless steel lever handles of design similar to locksets, unless otherwise specified. Provide key cylinders for keyed operating trim and, where specified, cylinder dogging.

B. Surface vertical rod panics shall only be provided less bottom rod; provide fire pins as required by exit device and door fire labels. Do not provide surface vertical rod panics at exterior doors.

C. Concealed vertical rod panics shall be provided less bottom rod at interior doors, unless lockable or otherwise specified; provide fire pins as required by exit device and door fire labels. Where concealed vertical rod panics are specified at exterior doors, provide with both top and bottom rods.

E. At non-rated openings with panic hardware, provide panic hardware with key cylinder dogging feature.

F. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

2.17 FLUSH BOLTS (LEVER EXTENSION)

A. Conform to ANSI A156.16. Flush bolts shall be Type L24081 unless otherwise specified. Furnish proper dustproof strikes conforming to ANSI A156.16, for flush bolts required on lower part of doors.

B. Lever extension manual flush bolts shall only be used at non-fire-rated pairs for rooms only accessed by maintenance personnel.

C. Face plates for cylindrical strikes shall be rectangular and not less than 25 mm by 63 mm (1 inch by 2-1/2 inches).

D. Friction-fit cylindrical dustproof strikes with circular face plate may be used only where metal thresholds occur.

E. Provide extension rods for top bolt where door height exceeds 2184 mm (7 feet 2 inches).

2.18 FLUSH BOLTS (AUTOMATIC)

A. Conform to ANSI A156.3. Dimension of flush bolts shall conform to ANSI A115. Bolts shall conform to Underwriters Laboratories, Inc., requirements for fire door hardware. Flush bolts shall automatically

latch and unlatch. Furnish dustproof strikes conforming to ANSI A156.16 for bottom flushbolt. Face plates for dustproof strike shall be rectangular and not less than 38 mm by 90 mm (1-1/2 by 3-1/2 inches).

B. At interior doors, provide auto flush bolts less bottom bolt, unless otherwise specified, except at wood pairs with fire-rating greater than 20 minutes; provide fire pins as required by auto flush bolt and door fire labels.

2.19 DOOR PULLS

A. Conform to ANSI A156.6. Pull plate 90 mm by 350 mm (3-1/2 inches by 14 inches), unless otherwise specified. Cut plates of door pulls for cylinders, or turn pieces where required.

2.20 PUSH PLATES

A. Conform to ANSI A156.6. Metal, Type J302, 200 mm (8 inches) wide by 350 mm (14 inches) high. Provide metal Type J300 plates 100 mm (4 inches wide by 350 mm (14 inches) high) where push plates are specified for doors with stiles less than 200 mm (8 inches) wide. Cut plates for cylinders, and turn pieces where required.

2.21 COMBINATION PUSH AND PULL PLATES

A. Conform to ANSI 156.6. Type J303, stainless steel 3 mm (1/8 inch) thick, 80 mm (3-1/3 inches) wide by 800 mm (16 inches) high), top and bottom edges shall be rounded. Secure plates to wood doors with 38 mm (1-1/2 inch) long No. 12 wood screws. Cut plates for turn pieces, and cylinders where required. Pull shall be mounted down.

2.22 COORDINATORS

A. Conform to ANSI A156.16. Coordinators, when specified for fire doors, shall comply with Underwriters Laboratories, Inc., requirements for fire door hardware. Coordinator may be omitted on exterior pairs of doors where either door will close independently regardless of the position of the other door. Coordinator may be omitted on interior pairs of non-labeled open where open back strike is used. Open back strike shall not be used on labeled doors. Paint coordinators to match door frames, unless coordinators are plated. Provide bar type coordinators, except where gravity coordinators are required at acoustic pairs. For bar type coordinators, provide filler bars for full width and, as required, brackets for push-side surface mounted closers, overhead stops, and vertical rod panic strikes.

2.23 THRESHOLDS

A. Conform to ANSI A156.21, mill finish extruded aluminum, except as otherwise specified. In existing construction, thresholds shall be installed in a bed of sealant with ¼-20 stainless steel machine screws and expansion shields. In new construction, embed aluminum anchors coated with epoxy in concrete to secure thresholds. Furnish thresholds for the full width of the openings.

B. For thresholds at elevators entrances see other sections of specifications.

C. At exterior doors and any interior doors exposed to moisture, provide threshold with non-slip abrasive finish.

D. Provide with miter returns where threshold extends more than 12 mm (0.5 inch) from fame face.

2.24 AUTOMATIC DOOR BOTTOM SEAL AND RUBBER GASKET FOR LIGHT PROOF OR SOUND CONTROL DOORS

A. Conform to ANSI A156.22. Provide mortise or under-door type, except where not practical. For mortise automatic door bottoms, provide type specific for door construction (wood or metal).

2.25 WEATHERSTRIPS (FOR EXTERIOR DOORS)

A. Conform to ANSI A156.22. Air leakage shall not to exceed 0.50 CFM per foot of crack length (0.000774m^3/s/m).

2.26 MISCELLANEOUS HARDWARE

A. Access Doors (including Sheet Metal, Screen and Woven Wire Mesh Types): Except for fire-rated doors and doors to Temperature Control Cabinets, equip each single or double metal access door with Lock Type E76213, conforming to ANSI A156.5. Key locks as directed. Ship lock prepaid to the door manufacturer. Hinges shall be provided by door manufacturer.

B. Cylinders for Various Partitions and Doors: Key cylinders same as entrance doors of area in which partitions and door occur, // except as otherwise specified //. Provide cylinders to operate locking devices where specified for following partitions and doors:

5. Fire-rated access doors-Engineer's key set.

6. Doors from corridor to electromagnetic shielded room.

C. Mutes: Conform to ANSI A156.16. Provide door mutes or door silencers Type L03011 or L03021, depending on frame material, of white or light gray color, on each steel or wood door frame, except at fire-rated frames, lead-lined frames and frames for sound-resistant, lightproof

and electromagnetically shielded doors. Furnish 3 mutes for single doors and 2 mutes for each pair of doors, except double-acting doors.

2.30 FINISHES

A. Exposed surfaces of hardware shall have ANSI A156.18, finishes as specified below. Finishes on all hinges, pivots, closers, thresholds, etc., shall be as specified below under "Miscellaneous Finishes." For field painting (final coat) of ferrous hardware, see Section 09 91 00, PAINTING.

B. 626 or 630: All surfaces on exterior and interior of buildings, except where other finishes are specified.

C. Miscellaneous Finishes:

1. Hinges --exterior doors: 626 or 630.
2. Hinges --interior doors: 652 or 630.
3. Pivots: Match door trim.
4. Door Closers: Factory applied paint finish. Dull or Satin Aluminum color.
5. Thresholds: Mill finish aluminum.
6. Cover plates for floor hinges and pivots: 630.
7. Other primed steel hardware: 600.

D. Hardware Finishes for Existing Buildings: U.S. Standard finishes shall match finishes of hardware in (similar) existing spaces // except where otherwise specified. //

F. Anti-microbial Coating: All hand-operated hardware (levers, pulls, push bars, push plates, paddles, and panic bars) shall be provided with an anti-microbial/anti-fungal coating that has passed ASTM E2180 tests. Coating to consist of ionic silver (Ag+). Silver ions surround bacterial cells, inhibiting growth of bacteria, mold, and mildew by blockading food and respiration supplies.

2.31 BASE METALS

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

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

PART 3 - EXECUTION

3.1 HARDWARE HEIGHTS

A. For existing buildings locate hardware on doors at heights to match existing hardware. The Contractor shall visit the site, verify location of existing hardware and submit locations to VA Resident Engineer for approval. Comply with all codes and VA requirements.

B. Hardware Heights from Finished Floor:

1. Exit devices centerline of strike (where applicable) 1024 mm (40-5/16 inches).
2. Locksets and latch sets centerline of strike 1024 mm (40-5/16 inches).
3. Deadlocks centerline of strike 1219 mm (48 inches).
4. Hospital arm pull 1168 mm (46 inches) to centerline of bottom supporting bracket.
5. Centerline of door pulls to be 1016 mm (40 inches).
6. Push plates and push-pull shall be 1270 mm (50 inches) to top of plate.
7. Push-pull latch to be 1024 mm (40-5/16 inches) to centerline of strike.
8. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.

3.2 INSTALLATION

A. Closer devices, including those with hold-open features, shall be equipped and mounted to provide maximum door opening permitted by building construction or equipment. Closers shall be mounted on side of door inside rooms, inside stairs, and away from corridors // except security bedroom, bathroom and anteroom doors which shall have closer installed parallel arm on exterior side of doors. //. At exterior doors, closers shall be mounted on interior side. Where closers are mounted on doors they shall be mounted with sex nuts and bolts; foot shall be fastened to frame with machine screws.

B. Hinge Size Requirements:

Door Thickness	**Door Width**	**Hinge Height**
45 mm (1-3/4 inch)	900 mm (3 feet) and less	113 mm (4-1/2 inches)
45 mm (1-3/4 inch)	Over 900 mm (3 feet) but not more than 1200 mm (4	125 mm (5 inches)

	feet)	
35 mm (1-3/8 inch) (hollow core wood doors)	Not over 1200 mm (4 feet)	113 mm (4-1/2 inches)

C. Hinge leaves shall be sufficiently wide to allow doors to swing clear of door frame trim and surrounding conditions.

D. Where new hinges are specified for new doors in existing frames or existing doors in new frames, sizes of new hinges shall match sizes of existing hinges; or, contractor may reuse existing hinges provided hinges are restored to satisfactory operating condition as approved by Resident Engineer. Existing hinges shall not be reused on door openings having new doors and new frames. Coordinate preparation for hinge cut-outs and screw-hole locations on doors and frames.

E. Hinges Required Per Door:

Doors 1500 mm (5 ft) or less in height	2 butts
Doors over 1500 mm (5 ft) high and not over 2280 mm (7 ft 6 in) high	3 butts
Doors over 2280 mm (7 feet 6 inches) high	4 butts
Dutch type doors	4 butts
Doors with spring hinges 1370 mm (4 feet 6 inches) high or less	2 butts
Doors with spring hinges over 1370 mm (4 feet 6 inches)	3 butts

F. Fastenings: Suitable size and type and shall harmonize with hardware as to material and finish. Provide machine screws and lead expansion shields to secure hardware to concrete, ceramic or quarry floor tile, or solid masonry. Fiber or rawl plugs and adhesives are not permitted. All fastenings exposed to weather shall be of nonferrous metal.

G. After locks have been installed; show in presence of Resident Engineer that keys operate their respective locks in accordance with keying requirements. (All keys, Master Key level and above shall be sent Registered Mail to the Medical Center Director along with the bitting list. Also a copy of the invoice shall be sent to the Resident Engineer for his records.) Installation of locks which do not meet specified keying requirements shall be considered sufficient justification for rejection and replacement of all locks installed on project.

3.3 FINAL INSPECTION

A. Installer to provide letter to VA Resident/Project Engineer that upon completion, installer has visited the Project and has accomplished the following:
   1. Re-adjust hardware.
   2. Evaluate maintenance procedures and recommend changes or additions, and instruct VA personnel.
   3. Identify items that have deteriorated or failed.
   4. Submit written report identifying problems.

3.4 DEMONSTRATION

A. Demonstrate efficacy of mechanical hardware and electrical, and electronic hardware systems, including adjustment and maintenance procedures, to satisfaction of Resident/Project Engineer and VA Locksmith.

3.5 HARDWARE SETS

A. Following sets of hardware correspond to hardware symbols shown on drawings. Only those hardware sets that are shown on drawings will be required. Disregard hardware sets listed in specifications but not shown on drawings.

ELECTRIC HARDWARE ABBREVIATIONS LEGEND:
ADO = Automatic Door Operator
EMCH = Electro-Mechanical Closer-Holder
MHO = Magnetic Hold-Open (wall- or floor-mounted)

INTERIOR SINGLE DOORS

HW-4C

Each Door to Have:		RATED
1	Continuous Hinge	A51031B x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1	Hospital Utility Lock	F09 x PADDLES POINTING DOWN
1	Key Cylinder	TYPE AS REQUIRED
1	Closer	C02011/C02021 (PT4D, PT4F, PT4H)
1	Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1	Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1	Overhead Stop	C01541-ADJUSTABLE
1	Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1	Auto Door Bottom	R0Y346 – HEAVY DUTY
1	Set Seals	R3C164

HW-E10

Each Sliding Door to Have:		NON-RATED
1	Set Track Hardware	TYPE REQUIRED FOR DOOR MATERIAL, WEIGHT, AND MOUNTING DETAILS (COMPLETE WITH TRACK, TRACK BRACKETS, HANGERS, GUIDES, BUMPERS, AND INTERNAL TRACK STOPS)
2	Pulls	1102T (TRIMCO), OR EQUAL
1	Padlock or Sliding Door Lock	TYPE AS REQUIRED (PADLOCK) OR MS1850SN-450 (SLIDING DOOR LOCK) (ADAMS RITE, OR EQUAL
2	Cylinder (for sliding dr lock)	TYPE AS REQUIRED

EXTERIOR PAIRS OF GATES

HW-G7

Each Pair Gates to Have:	NON-RATED
4 Weldable Gate Hinges	I-8513 X WELDED OR FASTENED X SHEAR HINGE LEAVES TO FIT GATE MEMBERS (BROOKFIELD), OR EQUAL
2 Padlockable Cane Bolts with Hold-up Springs	524-P23 x P23SP x 524PL (1 STRIKE @ ACTIVE LEAF; 2 STRIKES AT INACTIVE LEAF) (CROWN INDUSTRIAL), OR EQUAL
2 Padlocks	TYPE AS REQUIRED
1 Weldable Lock Box	K-BXMOR X TYPE TO FIT LOCK BRAND/MODEL X K-BXSTR STRIKE BRACKET (KEEDEX), OR EQUAL
1 Utility Lock	F09 X NON-FERROUS LOCK CASE
2 Stainless Steel Closer	C52011/C22021 (PT4D, PT4F, PT4H)

BALANCE OF HARDWARE BY SECTION 32 31 33, CHAIN LINK FENCES AND GATES // SECTION 32 31 19, DECORATIVE METAL FENCES AND GATES.

INSTALL CANE BOLTS ON PULL SIDE OF EACH LEAF. ACTIVE LEAF CANE BOLT TO HAVE STRIKE IN OPEN POSITION ONLY. INACTIVE LEAF CANE BOLT TO HAVE STRIKES IN BOTH OPEN AND CLOSED POSITIONS.

HW-G8

Each Pair Gates to Have:	NON-RATED
4 Weldable Gate Hinges	I-8513 X WELDED OR FASTENED X SHEAR HINGE LEAVES TO FIT GATE MEMBERS (BROOKFIELD), OR EQUAL
2 Padlockable Cane Bolts with Hold-up Springs	524-P23 x P23SP x 524PL (1 STRIKE @ ACTIVE LEAF; 2 STRIKES AT INACTIVE LEAF) (CROWN INDUSTRIAL), OR EQUAL
2 Padlocks	TYPE AS REQUIRED
1 Weldable Lock Box	K-BXMOR X TYPE TO FIT LOCK BRAND/MODEL X K-BXSTR STRIKE BRACKET (KEEDEX), OR EQUAL
1 Storeroom Lock	F13-MOD x RIGID OUTSIDE LEVER x KEY RETRACTS DEADBOLT AND LATCHBOLT
2 Stainless Steel Closer	C52011/C22021 (PT4D, PT4F, PT4H)

BALANCE OF HARDWARE BY SECTION 32 31 33, CHAIN LINK FENCES AND GATES // SECTION 32 31 19, DECORATIVE METAL FENCES AND GATES.

INSTALL CANE BOLTS ON PULL SIDE OF EACH LEAF. ACTIVE LEAF CANE BOLT TO HAVE STRIKE IN OPEN POSITION ONLY. INACTIVE LEAF CANE BOLT TO HAVE STRIKES IN BOTH OPEN AND CLOSED POSITIONS.

HW-G10

Each Rolling or Swing-Up Gate to Have:	NON-RATED
1 Padlock or 2 Cylinders	TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 32 31 33, CHAIN LINK FENCES AND GATES // SECTION 32 31 19, DECORATIVE METAL FENCES AND GATES

HW 169
Hardware by coiling door manufacturer; Section 08 33 00
1 Ea. Cylinder-type as required

HW 170
2 Ea. Continuous Gear Hinges Heavy Duty with EPT prep
2 Ea. Power Transfers EPT
1 Ea. Concealed Vertical Rod Exit Device Type 6 Function 03
Electric Latch Retraction
1 Ea. Concealed Vertical Rod Exit Device Type 6 Function 01
Electric Latch Retraction
1 Ea. Cylinder – provide type required for trim
1 Ea. Power Supply with battery Back Up to operate 2 ELR devices
1 Ea. Card Reader – (By Security Vendor) for active leaf only
1 Ea. Closer CO2021
1 Ea. Automatic Door Operator; see Section 08 71 13
1 Ea. Actuator – push pad type
2 Ea. Armor Plates J101 4BE 42” height
1 Ea. Weatherstripping ROY 164 bulb
1 Ea. Set Adjustable Weatherstripping Astragal ROY834
1 Ea. Threshold J32100
2 Ea. Door Sweeps ROY 536 vinyl
1 Ea. Rain Drip x 4” over door width
2 Ea. Door Monitoring Contacts
1 Ea. P.I.R. (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid entry into space via one door (other door is latched).
PIR sensor (provided and installed by Security Vendor) mounted above doors turns off door monitoring for programmed period of time allowing free exit from space.

HW 171
2 Ea. Continuous Gear Hinges Heavy Duty with EPT prep
2 Ea. Power Transfers EPT
2 Ea. Exit Device Type 6 Function 03
Electric Latch Retraction, Cylinder Dogging
4 Ea. Cylinder – provide type required for trim and dogging
1 Ea. Power Supply with Battery Back Up to operate 2 ELR devices
1 Ea. Card Reader – (By Security Vendor)
2 Ea. Automatic Door Operator; See Section 08 71 13
2 Ea. Actuators – push pad type
1 Ea. Weatherstripping – By Door Manufacturer
1 Ea. Threshold – By Door Manufacturer
1 Ea. Rain Drip x 4” over door width
2 Ea. Door Monitoring Contacts
1 Ea. P.I.R. Sensor (By Security Vendor)
2 Ea. Electromagnetic Locks
1 Ea. Card Reader (By Security Vendor) for both leaves
1 Ea. Emergency Override Button - Located in Lobby
Door Sequence: During regular business hours, door will operate by via interior and exterior automatic door operator sensor.
After hours, magnetic locks are energized. Card Reader (provided, installed and programmed by Security Vendor) de-energizes magnetic locks & operates automatic doors. PIR operates automatic doors from interior.
Emergency override button installed in lobby de-energizes magnetic locks and operates automatic doors or allows doors to be pushed open.

HW 172
3 Ea. Butts as required NRP
1 Ea. Exit Device Type 1 Function 03
1 Ea. Cylinder – provide type required
1 Ea. Closer C02021
1 Ea. Kick plate J102 4BE
1 Ea. Weatherstripping ROY 164 bulb
1 Ea. Threshold J32100
1 Ea. Door Sweep ROY 536 vinyl
1 Ea. Rain Drip x 4” over door width
1 Ea. Door Monitoring Contact

HW 173 3 Ea. Butts as required
1 Ea. Classroom Lockset F05
1 Ea. Kick plate J102 4BE
1 Ea. Closer C2011
1 Ea. Weatherstripping ROY 164 bulb
1 Ea. Threshold J32100
1 Ea. Door Sweep ROY 416 brush
1 Ea. Rain Drip x 4” over door width
1 Ea. Door Monitoring Contact

HW 173A
3 Ea. Butts as required NRP
1 Ea. Lockset – Storeroom F07
1 Ea. Kick plate J102 4BE
1 Ea. Closer C2021
1 Ea. Weatherstripping ROY 164 bulb
1 Ea. Threshold J32100
1 Ea. Door Sweep ROY 536 vinyl
1 Ea. Rain Drip x 4” over door width
1 Ea. Door Monitoring Contact
1 Ea. Card Reader (By Security Vendor)
1 Ea. Power Supply for Reader – (By Security Vendor)
1 Ea. Electric strike with in line conditioner/rectifier x mortar box
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access onto roof.
Exit hardware on outside of door will allow entry.

HW 173B 3 Ea. Butts as required
1 Ea. Electric Lockset
1 Ea. Kick plate J102 4BE
1 Ea. Closer C2011
1 Ea. Weatherstripping ROY 164 bulb
1 Ea. Threshold J32100
1 Ea. Door Sweep ROY 416 brush
1 Ea. Rain Drip x 4” over door width
1 Ea. Door Monitoring Contact
1 Ea. Card Reader (By Security Vendor)
1 Ea. P.I.R. Sensor (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access into room.
PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of

time allowing free exit from room.

HW 174
2 Ea. Continuous Gear Hinges Heavy Duty with EPt prep
2 Ea. Power Transfers EPT
2 Ea. Concealed Vertical Rod Exit Device Type 6 Function 03 Electric Latch Retraction
2 Ea. Cylinders – provide type required for trim
1 Ea. Power Supply with batter Back Up to operate 2 ELR devices
1 Ea. Card Reader – (By Security Vendor)
1 Ea. Power Supply for Reader – (By Security Vendor)
2 Ea. Automatic Door Operator; see Section 08 71 13
1 Ea. Actuator push pad type
2 Ea. Armor Plates J101 4BE 42” height
1 Ea. Weatherstripping ROY 164 bulb
1 Ea. Set adjustable weatherstripping astragal ROY834
1 Ea. Threshold J32100
2 Ea. Door Sweeps ROY 416 Brush
1 Ea. Rain Drip x 4” over door width
2 Ea. Door Monitoring Contacts
1 Ea. Emergency Key Override – Located in Lobby
1 Ea. Emergency Button Override – Located Outside Doors
1 Ea. P.I.R. Sensor (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) functions as actuator button, de-energizes magnetic locks and operates automatic doors elevator lobby. Emergency key override installed in lobby de-energizes magnetic locks and operates automatic doors or allows doors to be pushed open.
PIR sensor (provided and installed by Security Vendor) de-energizes magnetic locks and operates automatic doors from exterior. Emergency override button installed outside de-energizes magnetic locks and operates automatic doors or allows doors to be pulled open.

HW 175 - rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts TYPE 25 LESS BOTTOM BOLT
1 Storeroom Lock F07
1 Coordinator TYPE 21A
1 Overlapping Astragal with R5Y634 x R0E154 x THRU-BOLTS
Self-Adhesive Seal
2 Closers C02011/C02021 (PT4D, PT4F, PT4H)
2 Heavy-Duty Armor Plates J101 x 3.175 MM (0.125 INCH THICKNESS
2 Overhead Stops C01541-ADJUSTABLE

HW 176 - rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Electrified Lock Storeroom F07
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Electric Strike
1 In-Line Power Conditioner/Rectifier
1 Mortar Box
1 Door Status Contact
1 Heavy-Duty Armor Plate J101 x 3.175 MM (0.125 INCH)
THICKNESS
1 Card Reader and Request to Exit (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access into room.
PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of time allowing free exit from room.

HW 177 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Lock Storeroom F07
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Electric Strike
1 In-Line Power Conditioner/Rectifier
1 Mortar Box
1 Door Status Contact
1 Heavy-Duty Armor Plate J101 x 3.175 MM (0.125 INCH)
THICKNESS
1 Card Reader and Request to Exit (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
1 Edge guard at wood doors J208M/J211 (verify) cut: Hardware
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access into room. PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of time allowing free exit from room.

HW 178 – not rated
2 Closers
2 Push/Pulls
2 Floor Stops L02121 x 3 FASTENERS
1 Heavy-Duty Armor Plate J101 x 3.175 MM (0.125 INCH)
THICKNESS

HW 179 - rated
Hardware by coiling door manufacturer; Section 08 33 00
1 Ea. Cylinder-type as required

HW 180 – Not Rated
2 Ea. Continuous Gear Hinges Heavy Duty
2 Ea. Power Transfers EPT
2 Ea. Automatic Door Operator; See Section 08 71 13
2 Push/Pull Bar Sets J505 – 305 MM (12 INCH) CENTER-TO-CENTER PULL
AUTO DOOR OPERATORS, CONTROLS, AND REACTIVATION SENSORS BY
SECTION 08 71 13.11.
POWER TRANSFERS FOR RE-ACTIVATION SENSOR WIRING
(RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).
120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.
Door Sequence: Door will operate via interior and exterior automatic door operator sensor.

HW 181 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Electrified Lock Storeroom F07
1 Closer
1 Exit hardware
1 Electric Strike
1 In-Line Power Conditioner/Rectifier
1 Mortar Box
1 Door Status Contact
1 Overhead Stop
1 Card Reader (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access into room.
PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of time allowing free exit from space.

HW 182 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Electrified Lock Passage F31
1 Electric Strike
1 In-Line Power Conditioner/Rectifier
1 Mortar Box
1 Door Status Contact
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Overhead Stop
1 Set Self-Adhesive Seals R0E154
1 Card Reader (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access into room.
PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of time allowing free exit from room.

HW 183 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Lock Storeroom F07
1 Electric Strike
1 In-Line Power Conditioner/Rectifier
1 Mortar Box
1 Door Status Contact
1 Closer
1 Heavy-Duty Armor Plate J101 x 3.175 MM (0.125 INCH)
THICKNESS
Overhead Stop
1 Set Self-Adhesive Seals R0E154
1 Card Reader (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access into room.
PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of time allowing free exit from room.

HW 184 – not rated
1 Classroom Lock F08
1 Set Self-Adhesive Seals R0E154
2 Automatic Door Operator; see Section 08 71 13
AUTOMATIC DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.
POWER TRANSFER FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

HW 185 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock F07
1 Electric Strike
1 Lock Storeroom F07
1 In-Line Power Conditioner/Rectifier
1 Mortar Box
1 Door Status Contact
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Wall Stop L52101 CONVEX
1 Card Reader (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
1 Edge Guard at wood doors J208M/J211 (verify). Cut: Hardware
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access into room.
PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of time allowing free exit from room.

HW 186 – not rated
Hinges QUANTITY & TYPE AS REQUIRED 1 Latchset F01 (Passage) 1 Door pull 1 Push-pull plate J303 1 Closer C02051 1 Heavy-Duty Armor Plate J101 x 3.175 MM (0.125 INCH)
THICKNESS
1 Wall Stop L52101 CONVEX

3 Silencers L03011

HW 187 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Classroom Lock F08
1 Wall Stop L52101 CONVEX
3 Silencers L03011

HW 188 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Privacy Lock F02-MOD X OCCUPANCY INDICATOR
1 Kick Plate J102
1 Mop Plate J102
1 Wall Stop L52101 CONVEX
3 Silencers L03011

HW 189 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Electric Strike
1 Electrified Lock Storeroom F07
1 In-Line Power Conditioner/Rectifier
1 Mortar Box
1 Door Status Contact
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Kick Plate J102

1 Wall Stop L52101 CONVEX
1 Card Reader (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access into room.
PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of time allowing free exit from room.

HW 190 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock F07
1 Wall Stop L52101 CONVEX

HW 191 – not rated
Hinges quantity as required 180 degree hinges (Except at door GA115)
1 Storeroom Lock F07
1 Wall Stop L52101 CONVEX

HW 192 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Utility Lock F09
2 Closer C02051/C02061 (PT4D, PT4H)
2 Overhead Stop C04541
2 Sets Self-Adhesive Seals R0E154

HW 193 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Utility Lock F09
1 Closer C02051/C02061 (PT4D, PT4H)
1 Overhead Stop C04541
1 Set Self-Adhesive Seals R0E154

HW 194 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Office Lock F04
1 Wall Stop L52101 CONVEX
1 Set Self-Adhesive Seals R0E154
1 Coat Hook L03121

HW 195 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Classroom Lock F75
1 Closer
1 Overhead Stop C04541 (at GA118A)
1 Wall Stop L52101 CONVEX (at GA118)

HW 196 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Latchset F01
1 Closer (@ non-rated doors) C02051/C02061 (PT4D, PT4H)
1 Wall Stop L52101 CONVEX
1 Set Self-Adhesive Seals R0E154

HW 197 – rated
2 Continuous Hinges A51031B x INTEGRAL HINGE GUARD
CHANNEL X ADJUSTA-SCREWS

1 Auto Flush Bolt TYPE 25 (on inactive leaf)
1 Classroom Lock F08
1 Coordinator TYPE 21A
1 Overlapping Astragal with R5Y634 x R0E154 x THRU-BOLTS
Self-Adhesive Seal
2 Closers C02011/C02021 (PT4D, PT4F, PT4H)
2 Heavy-Duty Armor Plates J101 x 3.175 MM (0.125 INCH)
THICKNESS
1 Lock Trim Protector Bar R111LPB-630 (ROCKWOOD), OR EQUAL
2 Overhead Stops C01541-ADJUSTABLE
2 Auto Door Bottoms R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals R0E154
INSTALL LOCK TRIM PROTECTOR BAR ON PUSH SIDE OF ACTIVE LEAF TO
PROTECT LEVER TRIM.

HW 198 – not rated
2 Continuous Hinges A51031B x INTEGRAL HINGE GUARD
CHANNEL x ADJUSTA-SCREWS
1 Auto Flush Bolt TYPE 25 LESS BOTTOM BOLT
1 Passage Lock F01
1 Coordinator TYPE 21A
1 Overlapping Astragal with R5Y634 x R0E154 x THRU-BOLTS
Self-Adhesive Seal
2 Closers C02011/C02021 (PT4D, PT4F, PT4H)
2 Heavy-Duty Armor Plates J101 x 3.175 MM (0.125 INCH)
THICKNESS
1 Lock Trim Protector Bar R111LPB-630 (ROCKWOOD), OR EQUAL
2 Overhead Stops C01541-ADJUSTABLE
2 Auto Door Bottoms R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals R0E154

HW 199 – rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock F07
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Overhead Stop C01541-ADJUSTABLE
1 Wall Stop L52101 CONVEX (at GA142A)
1 Set Self-Adhesive Seals R0E154

HW 200 - rated
1 Continuous Hinge A51031B x INTEGRAL HINGE GUARD
CHANNEL X ADJUSTA-SCREWS
1 Exit Device TYPE 1 F08 LEVER
1 Key Cylinder TYPE AS REQUIRED
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Wall Stop L52101 CONVEX
1 Set Self-Adhesive Seals R0E154

HW 201 – rated
1 Continuous Hinge A51031B x INTEGRAL HINGE GUARD
CHANNEL X ADJUSTA-SCREWS
1 Exit Device TYPE 1 F08 LEVER
1 Key Cylinder TYPE AS REQUIRED
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Wall Stop L52101 CONVEX
1 Set Self-Adhesive Seals R0E154
1 Electric Strike
1 Electrified Lock TYPE AS REQUIRED
1 In-Line Power Conditioner/Rectifier
1 Mortar Box
1 Door Status Contact
1 Card Reader (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access from stairway into space.
PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of time allowing free exit.

HW 202 – rated
1 Continuous Hinge A51031B x INTEGRAL HINGE GUARD
CHANNEL X ADJUSTA-SCREWS
1 Exit Device TYPE 1 F08 LEVER (Exit only, no readmittance)
1 Key Cylinder TYPE AS REQUIRED
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Overhead Stop C01541-ADJUSTABLE
1 Set Self-Adhesive Seals R0E154

HW 203 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Latchset F01
1 Overhead Stop C01541-ADJUSTABLE
1 Set Self-Adhesive Seals R0E154
Note: If Alternate #2 is accepted, this hardware set will be provided by the Demountable partition sub contractor.

HW 204 – not rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Latchset F01
1 Wall Stop L52101 CONVEX
1 Set Self-Adhesive Seals R0E154
Note: If Alternate #2 is accepted, this hardware set will be provided by the Demountable partition sub contractor.

HW 205 – rated
2 Continuous Hinges A51031B x INTEGRAL HINGE GUARD
CHANNEL X ADJUSTA-SCREWS
1 Auto Flush Bolt TYPE 25 (on inactive leaf)
1 Classroom Lock F08
1 Coordinator TYPE 21A
1 Overlapping Astragal with R5Y634 x R0E154 x THRU-BOLTS
2 Sets Self-Adhesive Seal
2 Closers C02011/C02021 (PT4D, PT4F, PT4H)
2 Heavy-Duty Armor Plates J101 x 3.175 MM (0.125 INCH)
THICKNESS
1 Lock Trim Protector Bar R111LPB-630 (ROCKWOOD), OR EQUAL
2 Overhead Stops C01541-ADJUSTABLE
2 Set Self-Adhesive Seals R0E154
INSTALL LOCK TRIM PROTECTOR BAR ON PUSH SIDE OF ACTIVE LEAF TO PROTECT LEVER TRIM.

HW 206 – rated
2 Continuous Hinges A51031B x INTEGRAL HINGE GUARD
CHANNEL X ADJUSTA-SCREWS
1 Auto Flush Bolt TYPE 25 LESS BOTTOM BOLT (on
active leaf)
1 Auto Flush Bolt TYPE 25 (on inactive leaf)
1 Latchset F01
1 Coordinator TYPE 21A
1 Overlapping Astragal with R5Y634 x R0E154 x THRU-BOLTS
Self-Adhesive Seal
2 Closers C02011/C02021 (PT4D, PT4F, PT4H)
2 Heavy-Duty Armor Plates J101 x 3.175 MM (0.125 INCH)
THICKNESS

1 Lock Trim Protector Bar R111LPB-630 (ROCKWOOD), OR EQUAL
2 Overhead Stops C01541-ADJUSTABLE
2 Set Self-Adhesive Seals R0E154
INSTALL LOCK TRIM PROTECTOR BAR ON PUSH SIDE OF ACTIVE LEAF TO PROTECT LEVER TRIM.

HW 207 - rated
1 Continuous Hinge A51031B x INTEGRAL HINGE GUARD
CHANNEL X ADJUSTA-SCREWS
1 Exit Device TYPE 1 F08 LEVER
1 Key Cylinder TYPE AS REQUIRED
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Set Self-Adhesive Seals R0E154
1 Overhead Stop C01541-ADJUSTABLE

HW 208 - rated
Hinges QUANTITY & TYPE AS REQUIRED
1 Electric Strike
1 Lock Storeroom F07
1 In-Line Power Conditioner/Rectifier
1 Mortar Box
1 Door Status Contact
1 Closer C02011/C02021 (PT4D, PT4F, PT4H)
1 Armor Plate J101 x 1.275 MM (0.050 INCH)
THICKNESS
1 Overhead Stop C01541-ADJUSTABLE
1 Set Self-Adhesive Seals R0E154
1 Card Reader (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
Door Sequence: Card Reader (provided and installed by Security Vendor) allows valid access from bridge into vestibule. PIR sensor (provided and installed by Security Vendor) mounted above door in space turns off door monitoring for programmed period of time. Card Reader (provided and installed by Security Vendor) allows valid access.

HW 209 - rated
2 Continuous Transfer Hinges A51031B x INTEGRAL HINGE GUARD
CHANNEL X ADJUSTA-SCREWS x (2) 4-
THRUWIRE TRANSFERS X IN-HINGE
ACCESS PANEL
1 Key Cylinder TYPE AS REQUIRED
1 Coordinator TYPE 21A
1 Overlapping Astragal with R5Y634 x R0E154 x THRU-BOLTS
Self-Adhesive Seal
2 Armor Plates J101 x 1.275 MM (0.050 INCH)
THICKNESS
2 Overhead Stops C01541-ADJUSTABLE
2 Sets Self-Adhesive Seals R0E154
2 Key Override Switch
1 Door Status Contact
1 Electromagnetic Lock
1 Card Reader (By Security Vendor)
1 Power Supply for Reader (By Security Vendor)
2 Automatic Door Operator; see Section 08 71 13

TOP POWER TRANSFER IS FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).
AUTOMATIC DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

Notes:
1. Door status switches (door contacts) shall be installed in the door frame.
2. Card reader operations shall be “fail safe open” allowing free entry when card reader is activated or loss of power. Doors with card readers shall allow free exiting at all times.
3. Provide fire labeled hardware at fire rated doors. See door schedule for location and rating of fire doors.

- - - E N D - - -

SECTION 08 71 13
AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following types of automatic door operators:
   1. Exterior and interior, automatic door operators, full low energy, with visible mounting.
   2. Automatic door operators shall be configured for doors as follows: Simultaneous pairs, out swing, in swing, and double egress.

B. Related Sections:
   1. Division 8 Section “Doors and Frames” for entrances furnished and installed separately in Division 8 Section.
   2. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for entrances furnished and installed separately in Division 8 Section.
   3. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
   4. Division 26 [16] Sections for electrical connections provided separately in Division 26 [16} Section including conduit and wiring for power to, and control of, automatic door operators.
   5. Division 28 [13] Section “Electronic Safety and Security” for controls not specified in this section.

1.3 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. Underwriters Laboratories (UL):
   1. UL 325 – Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
   2. UL 10C – Positive Pressure Fire Tests of Door Assemblies

C. American National Standards Institute (ANSI)/Builders’ Hardware Manufacturers Association (BHMA):
   1. ANSI/BHMA A156.10: Standard for Power Operated Pedestrian Doors.
   2. ANSI/BHMA A156.19: Standard for Power Assist and Low Energy Power Operated Doors.

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

1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

E. American Association of Automatic Door Manufacturers (AAADM):

F. National Fire Protection Association (NFPA):
1. NFPA 101 – Life Safety Code.
2. NFPA 70 – National Electric Code.

G. International Code Council (ICC):
1. IBC: International Building Code

H. Building Officials and Code Administrators International (BOCA), 1999:

I. International Standards Organization (ISO):
1. ISO 9001 - Standard for Manufacturing Quality Management Systems

J. National Association of Architectural Metal Manufacturers (NAAMM):
1. Metal Finishes Manual for Architectural and Metal Products.

K. American Architectural Manufacturers Association (AAMA):
1. AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.
2. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.

1.4 DEFINITIONS

A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide automatic door operators capable of withstanding loads and thermal movements based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Operating Range: Minus 30 deg F (Minus 34 deg C) to 130 deg F (54 deg C).

C. Opening-Force Requirements for Egress Doors: In the event power failure to the operator, swinging automatic entrance doors shall open with a manual force, not to exceed 30 lbf (133 N) applied at 1” (25 mm) form the latch edge of the door.

D. Break Away Requirements: Automatic door operators shall breakaway with no more than 30 lbf (133 N) applied at 1” (25 mm) from the latch edge of the door.

1.6 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 01 submittal procedures.

B. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work. Indicate wiring for electrical supply.

C. Color Samples for selection of factory-applied color finishes.

D. Closeout Submittals: Provide the following with project close-out documents.
1. Owner’s Manual.
2. Warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative, with certificate issued by AAADM, who is trained for installation and maintenance of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer with a manufacturing facility certified under ISO 9001.

C. Manufacturer shall have in place a national service dispatch center providing 24 hours a day, 7 days a week, emergency call back service.

D. Certifications: Automatic door operators shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards:
1. ANSI/BHMA A156.10 and A156.19.
2. NFPA 101.
3. UL 325 Listed.
4. UL 10C Listed.
5. IBC 2009
6. BOCA

E. Source Limitations: Obtain automatic door operators through one source from a single manufacturer.

F. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of swinging doors equipped with automatic door operators and are based on the specific system indicated. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

G. Power Operated Door Standard: ANSI/BHMA A156.19.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

I. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for swinging automatic entrance doors

serving as a required means of egress.

1.8 PROJECT CONDITIONS

A. Field Measurements: General Contractor shall verify openings to receive automatic door operators by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Mounting Surfaces: General Contractor shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.

C. Other trades: General Contractor Advise of any inadequate conditions or equipment.

1.9 COORDINATION

A. Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to, power supplies, remote activation devices, electric door latching hardware, and security access control system. See Division 28 [13] Section "Electronic Safety and Security" for controls not provided under this section.

C. System Integration: Integrate automatic door operators with other systems as required for a complete working installation.
   1. Provide electrical interface control capability for activation of automatic door operators by secure activation system on doors with electric locking.
   2. Where indicated to install both push plates and secure activation system, automatic door operators shall be configured to operate; by secure activation system when secured; by push plate when not secured.
   3. Where required for proper operation, provide a time delay relay to signal automatic door operator to activate only after electric lock system is released.

1.10 WARRANTY

A. Automatic door operators shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.

B. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.

C. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PART 2 - PRODUCTS

2.1 AUTOMATIC DOOR OPERATORS

A. Basis of Design Manufacturer: Stanley Access Technologies; Magic-Force™ Series automatic door operator.
   1. Contact: Stanley Access Technologies, 6268 St. John Wood, Williamsburg VA 23188; Attn: Mark Law; Phone: 804-598-0502; Fax: 866-872-3045; Email: mark.law@sbdinc.com.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Headers: 6063-T6.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   3. Sheet and Plate: ASTM B 209.

2.3 COMPONENTS

A. Header Case: Header case shall not exceed 6” (152 mm) square in section and shall be fabricated from extruded aluminum with structurally integrated end caps, designed to conceal door operators and controls. The operator shall be sealed against dust, dirt, and corrosion within the header case. Access to the operator and electronic control box shall be provided by a full-length removable cover, edge rabbetted to the header to ensure a flush fit. Removable cover shall be secured to prevent unauthorized access.

B. Door Arms: A combination of door arms and linkage shall provide positive control of door through entire swing; units shall permit use of butt hung, center pivot, and offset pivot-hung doors.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

D. Signage: Provide signage in accordance with ANSI/BHMA A156.19.

2.4 SWINGING DOOR OPERATORS

A. General: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

B. Electromechanical Operators: Self-contained unit powered by a minimum 3/16 horsepower, permanent-magnet DC motor; through a high torque reduction gear system.
   1. Operation: Power opening and spring closing.
   2. Operator Type: Low energy; readily convertible to full energy; no tools required to change type.

3. Handing: Non-handed; no tools required to change handing.
4. Capacity: Rated for door panels weighing up to 350 lb (159 kg).
5. Mounting: Concealed Visible
6. Features:
   a. Adjustable opening and closing speeds.
   b. Adjustable opening and closing force.
   c. Adjustable back-check.
   d. Adjustable hold-open time between 0 and 30 seconds.
   e. Reverse on obstruction.
   f. Closed loop speed control with active braking and acceleration.
   g. Variable obstruction recycle time delay.
   h. Optional Switch to open/Switch to close operation.
   i. When operators are provided in pairs, adjustable features are independently adjustable for each operator.

C. Field Adjustable Spring Closing Operation: The operator shall close the door by spring energy employing the motor, as a dynamic brake to provide closing speed control. The closing spring shall be a helical compression spring, adjustable for positive closing action. The spring shall be adjustable, without removing the operator from the header, to accommodate a wide range of field conditions.

D. Independent Adjustable Closing and Latching Speed Control: The operator shall employ a rheostat module to allow for independent field adjustment of closing and latching speeds using the motor as a dynamic brake.

E. Field Adjustable Open Stop: The operator shall provide a field adjustable open stop to accommodate opening angles from 80 to 135 degrees without the need for additional components.

F. Consistent Cycle: The operator shall deliver an even, consistent open force across the entire transition from door fully closed to door fully open. Additionally, the range of the force shall be field adjustable to accommodate a wide range of on-site conditions.

G. Quiet Performance: The operator shall be designed to output audible noise ratios less than or equal to 50dba.

H. Manual Use: The operator shall function as a manual door closer in the direction of swing with or without electrical power. The operator shall deliver an even, consistent open force across the entire transition from door fully closed to door fully open.

I. Electrical service to door operators shall be provided under Division 16 Electrical. Minimum service to be 120 VAC, 10 amps for doors with operators in pairs, 5 amps for single doors.

2.5 ELECTRICAL CONTROLS

A. Electrical Control System: Electrical control system shall include a microprocessor controller and position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position. Systems utilizing external magnets and magnetic switches are not acceptable.

B. Life Cycle Data Counter: The microprocessor control shall incorporate a non-re-settable counter to track door operation cycles.

C. Controller Protection: The microprocessor controller shall incorporate the following features to ensure trouble free operation:
   1. Automatic Reset Upon Power Up.
   2. Main Fuse Protection.
   3. Electronic Surge Protection.
   4. Internal Power Supply Protection.
   5. Resetable sensor supply fuse protection.
   6. Motor Protection, over-current protection.

D. Push Button Interface: The controller shall have push button switches with two digit LED readout to allow for selection or change of the following parameters: carpet or timer logic, single or dual door, activation options, normal back check or large back check, push-to-open assist on/off.

E. Soft Start/Stop: A "soft-start" "soft-stop" motor driving circuit shall be provided for smooth normal opening and recycling.

F. Obstruction Recycle: Provide system to recycle the swinging panels when an obstruction is encountered during the closing cycle. If an obstruction is detected, the system shall search for that object on the next closing cycle by reducing door closing speed prior to the previously encountered obstruction location, and will continue to close in check speed until doors are fully closed, at which time the doors will reset to normal speed. If obstruction is encountered again, the door will come to a full stop. The doors shall remain stopped until obstruction is removed and operate signal is given, resetting the door to normal operation.

G. Programmable Controller: Microprocessor controller shall be programmable and shall be designed for connection to a local configuration tool. Local configuration tool shall be software driven and shall be utilized via Palm® handheld interface. The following parameters may be adjusted via the configuration tool.
   1. Operating speeds and forces as required to meet ANSI/BHMA A156.19.
   2. Adjustable and variable features as specified in 2.4, B.
   3. Firmware update.
   4. Trouble Shooting
      a. I/O Status.
      b. Electrical component monitoring including parameter summary.
   5. Software for local configuration tool shall be available as a free download from the automatic door operator manufacturer's internet site.

H. Emergency Breakout Switch: A cam actuated emergency breakout switch shall be provided to disconnect power to the motor when an in-swinging door is manually pushed in the emergency out direction. The operator will then automatically reset and power will be resumed.

I. Control Switch: Automatic door operators shall be equipped with a three position function switch to control the operation of the door.

Control switch shall provide three modes of operation, Automatic, Off, and Hold-Open.

J. Power Switch: Automatic door operators shall be equipped with a two position On/Off switch to control power to the door.

2.6 ACTIVATION DEVICES

A. Push Plates: Provide 4 ½ inch (114 mm) square push plates with UL recognized SPDT switch. Face plates and mounting studs shall be stainless steel. Face plates shall be engraved with the international symbol for accessibility and "Push To Open". Push plates shall be wall mounted in single or double gang electrical boxes and hardwired to door operator controls.

2.7 ALUMINUM FINISHES

A. General: Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designing finishes. Finish designations prefixed by AA comply with system established by Aluminum Association for designing finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.40 mils minimum complying with AAMA 611-98, and the following:
   1. AAMA 607.1
   2. Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of swinging automatic entrance doors. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.

B. Mounting: Install automatic door operators/headers plumb and true in alignment with established lines and grades. Anchor securely in place.
   1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
   2. Set headers, arms and linkages level and true to location with anchorage for permanent support.

C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 16 Sections.

D. Sealants: Comply with requirements specified in Division7 Section "Joint Sealants" to provide weather tight installation.

3.3 FIELD QUALITY CONTROL

A. Testing Services: Factory Trained Installer shall test and inspect each swinging automatic entrance door to determine compliance of installed systems with applicable ANSI standards.

3.4 ADJUSTING

A. Adjust door operators, controls, and hardware for smooth and safe operation, for weather-tight closure, and complying with requirements in ANSI/BHMA A156.19 by AAADM Certified Technician.

3.5 CLEANING AND PROTECTION

A. Clean surfaces promptly after installation. Remove excess sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.

END

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies glass, plastic, related glazing materials and accessories. Glazing products specified apply to factory or field glazed items.

1.2 RELATED WORK

A. Factory glazed by manufacturer in following units:
   1. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
   2. Section 08 14 00, WOOD DOORS.

B. Field glazed in the following units:
   1. ICU/CCU entry doors: 08 41 13, SLIDING ALUMINUM DOORS.

1.3 LABELS

A. Temporary labels:
   1. Provide temporary label on each light of glass 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.

C. Glass Thickness:
   Thicknesses listed are minimum. Coordinate thicknesses with door system manufacturers.

1.4 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Certificates:

1. Certificates stating that wire glass, meets requirements for safety glazing material as specified in ANSI Z97.1.

C. Warranty: Submit written guaranty, conforming to General Condition requirements.

D. Manufacturer's Literature and Data:

1. Glass, each kind required.
2. Elastic compound for metal sash glazing.
3. Glazing cushion.
4. Sealing compound.

E. Samples:

1. Size: 150 mm by 150 mm (6 inches by 6 inches).
2. Tinted glass.

F. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer’s test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.

B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.

C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

1.6 PROJECT CONDITIONS

Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

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 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

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.

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.

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

E1300-09.....Determining Load Resistance of Glass in Buildings.

E2190-08.....Insulating Glass Unit

C. Code of Federal Regulations (CFR):

16 CFR 1201 - Safety Standard for Architectural Glazing Materials; 1977, with 1984 Revision.

D. National Fire Protection Association (NFPA):

80-08.....Fire Doors and Windows.

E. National Fenestration Rating Council (NFRC)

F. Safety Glazing Certification Council (SGCC)2009:

Certified Products Directory (Issued Semi-Annually).

G. Unified Facilities Criteria (UFC):

4-010-01-2007.....DOD Minimum Antiterrorism Standards for Buildings

H. Glass Association of North America (GANA):

Glazing Manual (Latest Edition)

Sealant Manual (2008)

I. 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 Tempered Glass:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

2.3 GLAZING ACCESSORIES

A. Provide at ICC/CCU doors manufacturer’s standard snap in glazing accessories for field glazing. Provide 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. 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.

G. Neoprene, EPDM, or Vinyl Glazing Gasket: ASTM C864.
1. Channel shape; flanges may terminate above the glazing channel or flush with the top of the channel.
2. Designed for dry glazing.

H. Color:
1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames shall match color of the finished aluminum and be nonstaining.
2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted shall be black, gray, or neutral color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer’s approved shop drawings.

B. Advise Contractor of conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation: Do

not proceed with installation until unsatisfactory conditions have been corrected.

C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units to prevent damage to glass and glazing units by cleaning materials.

3.2 PREPARATION

A. For sealant glazing, prepare glazing surfaces in accordance with GANA-02 Sealant Manual.

B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.

C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.

D. Verify that components used are compatible.

E. Clean and dry glazing surfaces.

F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.3 INSTALLATION - GENERAL

A. Install in accordance with GANA-01 Glazing Manual and GANA-02 Sealant Manual unless specified otherwise.

B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.

C. Set glazing without bending, twisting, or forcing of units.

D. Do not allow glass to rest on or contact any framing member.

E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.

G. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.

H. Laminated Glass:

1. Tape edges to seal interlayer and protect from glazing sealants.
2. Do not use putty or glazing compounds.

I. Insulating Glass Units:

1. Glaze in compliance with glass manufacturer's written instructions.
2. When glazing gaskets are used, they shall be of sufficient size and depth to cover glass seal or metal channel frame completely.
3. Do not use putty or glazing compounds.

4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.
5. Install with tape or gunnable sealant in wood sash.

3.4 INSTALLATION - DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

A. Cut glazing tape or spline to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.
B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
F. Trim protruding tape edge.

3.5 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.
B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
C. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.
E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
F. Fill gap between glazing and stop with _____ type sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line.

3.6 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.

3.7 PROTECTION

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

3.13 GLAZING SCHEDULE

A. Tempered Glass:

1. Install 1/4” thick clear tempered glass in doors as shown on the Finish Schedule.

B. Glazing in wood doors to be factory glazed. Glazing in ICC/CCU xSliding Aluminum Doors to be field glazed.

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SECTION 08 90 00
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies prefinished fixed wall louvers.

1.2 RELATED WORK

A. Brick Veneer: Section 04 20 00 UNIT MASONRY

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, installation and anchorage details.

C. Submit 12” x 12” sample of the specified louver showing all components of the specified louver.

D. Provide 2” x 2” x 1/18” extruded aluminum samples of the specified type showing the range of colors available to match existing exterior wall panels.

C. Manufacturer's Literature and Data:

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum, Extruded: ASTM B221/B221M.

B. 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.

C. Inorganic Zinc Primer: MPI No. 19.

2.2 EXTERIOR WALL LOUVERS

A. Basis of Design: Subject to compliance with requirements, provide Construction Specialties, Inc., (C/S Group): C/S 7” deep storm resistant fixed horizontal louver, Model RS-7315 or comparable product conforming to the Design and Performance Requirements of this Specification.

B. 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.

C. Performance Characteristics:
   1. Weather louvers shall have a minimum of 50 percent free area and shall pass 1000 mm/s (fpm) free area velocity at a pressure drop not exceeding 0.15 mm (inch) water gage and carry not more than 0.01 g (ounces) of water per m² (square foot) of free area for 15 minutes when tested per AMCA Standard 500-L.

D. Aluminum Louvers:

2. Louvers shall bear AMCA certified rating seals for air performance and water penetration ratings.

E. 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. Louvers, fixed: Make frame sizes 13 mm (1/2-inch) smaller than openings. Single louvers frames shall not exceed 1700 mm (66 inches) wide. When openings exceed 1700 mm (66 inches), provide twin louvers separated by mullion members.

2.3 CLOSURE ANGLES AND CLOSURE PLATES

A. Fabricate from 2 mm (0.074-inch) thick stainless steel or aluminum.

B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.

C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as specified.

2.4 WIRE GUARDS

A. Provide wire guards on inside of all exterior louvers, except on exhaust air louvers.

B. Fabricate frames from 2 mm (0.081-inch) thick extruded or sheet aluminum 1.5 mm (0.059-inch) thick designed to retain wire mesh.

C. Wire mesh shall be woven from not less than 1.6 mm (0.063-inch) diameter aluminum wire stainless steel wire in 13 mm (1/2-inch) square mesh.

D. Miter corners and join by concealed corner clips or locks extending about 57 mm (2-1/4 inches) into rails and stiles. Equip wire guards over four feet in height with a mid-rail constructed as specified for frame components.

E. Fasten frames to outside of louvers with aluminum or stainless steel devices designed to allow removal and replacement without damage to the wire guard or the louver.

2.5 FINISH

A. Finishes on aluminum face sheets:

1. AA-R1X finish Fluoropolymer enamel finish, consisting of a chemical pre-treatment of the base aluminum; then applying a primer coat of 0.1 to 0.4 mil dry film thickness; a polyvinylidene fluoride resin finish coat of 0.8 mil minimum dry film thickness on one side, and a wash coat of 0.3 to 0.4 mil minimum dry film thickness applied to reverse side.

B. Finish numbers for aluminum specified herein are in accordance with The Aluminum Association's Designation System. Each aluminum finish number

preceded by letters AA identifies it as an Aluminum Association designation.

1. Color shall match existing roofing and siding panels as approved by the Engineer.

2.6 PROTECTION

A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous paint (complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.

B. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.

C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work. Strippable plastic coating on colored finish is not acceptable.

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.

B. All movable parts, including hardware, shall be cleaned and adjusted to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have

all contact surfaces fit tight and even without forcing or warping the components

- - - E N D - - -

SECTION 09 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 or other building boards.

1.2 RELATED WORK

A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
C. Pull down tabs in steel decking: Section 05 36 00, COMPOSITE METAL DECKING.
D. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS// Section 09 29 00, GYPSUM BOARD.

1.3 TERMINOLOGY

A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.
B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.
C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
   1. Studs, runners and accessories.
   2. Hanger inserts.
   3. Channels (Rolled steel).
   4. Furring channels.
   5. Screws, clips and other fasteners.
C. Shop Drawings:
   1. Typical ceiling suspension system.
   2. Typical metal stud and furring construction system including details around openings and corner details.
   3. Typical shaft wall assembly

4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.

D. Test Results: Fire rating test designation, each fire rating required for each assembly.

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)minimum.
   2. Runners same thickness as studs.
B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.
C. Doubled studs for openings and studs for supporting concrete backer-board.
D. Studs 3600 mm (12 feet) or less in length shall be in one piece.
E. Shaft Wall Framing:
   1. Conform to rated wall construction.
   2. C-H Studs.
   3. E Studs.
   4. J Runners.
   5. Steel Jamb-Strut.

2.3 FURRING CHANNELS

A. Rigid furring channels (hat shape): ASTM C645.
B. Resilient furring channels:
   1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
   2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.
C. "Z" Furring Channels:
   1. Not less than 0.45 mm (0.0179-inch)-thick bare metal, with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.
   2. Web furring depth to suit thickness of insulation with slotted perforations.
D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

A. ASTM C754, except as otherwise specified.

B. For fire rated construction: Type and size same as used in fire rating test.

C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.

D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.

E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.

F. Tie Wire and Hanger Wire:

1. ASTM A641, soft temper, Class 1 coating.
2. Gage (diameter) as specified in ASTM C754 or ASTM C841.

G. Attachments for Wall Furring:

1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.
2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.

H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

2.5 SUSPENDED CEILING SYSTEM FOR GYPSUM BOARD (OPTION)

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

B. Wall track channel with 35 mm (1-3/8 inch) wide flange.

PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be same as that used in fire rating test.

B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2) of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

3.2 INSTALLING STUDS

A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.

B. Space studs not more than (16 inches) on center.
C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.
D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.
E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions and insulated exterior wall furring.
G. Openings:
   1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
   2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
   3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.
H. Fastening Studs:
   1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
   2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.
I. Chase Wall Partitions:
   1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
   2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).
J. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.
K. 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. In addition where otherwise shown provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, tack boards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items such as automatic door buttons and automatic door operators supported by stud construction.

B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.5 INSTALLING SHAFT WALL SYSTEM

A. Conform to UL Design No. U438 for two-hour fire rating. Provide one hour fire rating Shaft wall as show on the Drawings.

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 and for plaster ceilings or soffits.
   1. Space framing at 400 mm (16-inch) centers for metal lath anchorage.
   2. Space framing at 600 mm (24-inch) centers for gypsum board anchorage.

B. Concrete slabs on steel decking composite construction:
   1. Use pull down tabs when available.
   2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.

C. Where bar joists or beams are more than 1200 mm (48 inches) apart, provide intermediate hangers so that spacing between supports does not exceed 1200 mm (48 inches). Use clips, bolts, or wire ties for direct attachment to steel framing.

D. Existing concrete construction exposed or concrete on steel decking:
   1. Use power actuated fasteners either eye pin, threaded studs or drive pins for type of hanger attachment required.
   2. Install fasteners at approximate mid height of concrete beams or joists. Do not install in bottom of beams or joists. //

E. Installing suspended ceiling system for gypsum board (ASTM C635 Option):
   1. Install only for ceilings to receive screw attached gypsum board.
   2. Install in accordance with ASTM C636.
      a. Install main runners spaced 1200 mm (48 inches) on center.
      b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
      c. Install wall track channel at perimeter.

F. Installing Ceiling Bracing System:
   1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm

(8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap channels not less than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.

2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.
3. Brace suspended ceiling or soffit framing in seismic areas in accordance with ASTM E580.

3.7 TOLERANCES

A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
B. Plumb and align vertical members within 3 mm (1/8-inch.)
C. Level or align ceilings within 3 mm (1/8-inch.)

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SECTION 092400

PORTLAND CEMENT PLASTERING

PART 1 - **GENERAL**

This Section includes interior portland cement plasterwork on **metal lath**.

A. Related Sections:

1. Division 05 Section "Cold-Formed Metal Framing" for structural, load-bearing (transverse and axial) steel studs and joists that support lath and portland cement plaster.
2. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support lath and portland cement plaster.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.4 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F (4.4 deg C) for at least 48 hours before plaster application, and continuously during and after application.

1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 - PRODUCTS

2.1 METAL LATH

A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, hot-dip galvanized zinc coating.

1. Diamond-Mesh Lath **Self-furring, 2.5 lb/sq. yd. (1.4 kg/sq. m).**

2.2 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch 13 mm long, free of contaminants, manufactured for use in portland cement plaster.

C. Bonding Compound: ASTM C 932.

D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.

E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

F. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter, unless otherwise indicated.

2.3 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, **Type I**.

1. Color for Finish Coats: **White**.

B. Plastic Cement: ASTM C 1328.

C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

PLASTER MIXES

D. General: Comply with ASTM C 926 for applications indicated.

E. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:

1. Portland Cement Mixes:

a. Scratch Coat: For cementitious material, mix 1 part portland cement and **0 to 3/4**. Use 2-1/2 to 4 parts aggregate per part of cementitious material.

b. Brown Coat: For cementitious material, mix 1 part portland cement and **0 to 3/4** parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. With Installer present, examine areas and substrates including structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

3.3 INSTALLATION, GENERAL

3.4 INSTALLING METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 1063.

1. On ceiling framing: Install **flat diamond-mesh** lath.

3.5 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

3.6 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
2. Finish plaster flush to adjacent walls.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Bonding Compound: Apply on plaster bases.

C. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; **3/4 inch (19 mm) thick on concrete**].

1. Portland cement mixes.

D. Plaster Finish Coats: Apply to provide uniform **float** finish for field applied paint.

3.7 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.8 PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

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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 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

B. Sound deadening board: Section 07 21 13, THERMAL INSULATION.

C. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.

D. Plaster ceiling: Section 092400, PORTLAND CEMENT PLASTERING

D. Lay in gypsum board ceiling panels: Section 09 51 00, ACOUSTICAL CEILING.

1.3 TERMINOLOGY

A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.

B. Underside of Structure Overhead: the underside of structure overhead shall be the underside of the composite metal deck.

C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Cornerbead and edge trim.
2. Finishing materials.
3. Laminating adhesive.
4. Gypsum board, each type.

C. Shop Drawings:

1. Typical gypsum board installation, showing corner details, edge trim details and the like.
2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
3. Typical shaft wall assembly.
4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.

D. Test Results:

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

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

In accordance with the requirements of ASTM C840.

1.7 APPLICABLE PUBLICATIONS

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

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

C11-08.....Terminology Relating to Gypsum and Related Building Materials and Systems

C475-02.....Joint Compound and Joint Tape for Finishing Gypsum Board

C840-08.....Application and Finishing of Gypsum Board

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

C954-07.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Stud from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness

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

C1047-05.....Accessories for Gypsum Wallboard and Gypsum Veneer Base

C1177-06.....Glass Mat Gypsum Substrate for Use as Sheathing

C1658-06.....Glass Mat Gypsum Panels

C1396-06.....Gypsum Board

E84-08.....Surface Burning Characteristics of Building Materials

C. Underwriters Laboratories Inc. (UL):

Latest Edition.....Fire Resistance Directory

D. Inchcape Testing Services (ITS):

Latest Editions.....Certification Listings

PART 2 - PRODUCTS

2.1 GYPSUM BOARD

A. Gypsum Board: ASTM C1396, Type X, 16 mm (5/8 inch) thick unless shown otherwise. Shall contain a minimum of 20 percent recycled gypsum.

B. Coreboard or Shaft Wall Liner Panels.

1. ASTM C1396, Type X.
2. ASTM C1658: Glass Mat Gypsum Panels,

3. Coreboard for shaft walls 300, 400, 600 mm (12, 16, or 24 inches) wide by required lengths 25 mm (one inch) thick with paper faces treated to resist moisture.

C. Water Resistant Gypsum Backing Board: ASTM C620, Type X, 16 mm (5/8 inch) thick.

D. Gypsum cores shall contain a minimum of 95 percent post industrial recycled gypsum content. Paper facings shall contain 100 percent post-consumer recycled paper content.

2.3 ACCESSORIES

A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.

B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

2.4 FASTENERS

A. ASTM C1002 and ASTM C840, except as otherwise specified.

B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).

C. Select screws of size and type recommended by the manufacturer of the material being fastened.

D. For fire rated construction, type and size same as used in fire rating test.

E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

2.5 FINISHING MATERIALS AND LAMINATING ADHESIVE

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

PART 3 - EXECUTION

3.1 GYPSUM BOARD HEIGHTS

A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:

1. Two sides of partitions:
   a. Fire rated partitions.
   b. Smoke partitions.
   c. Sound rated partitions.
   d. Full height partitions shown (FHP).
   e. Corridor partitions.
2. One side of partitions or furring:
   a. Inside of exterior wall furring or stud construction.
   b. Room side of room without suspended ceilings.

c. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.

3. Extend all layers of gypsum board construction used for fireproofing of columns from floor to underside of structure overhead, unless shown otherwise.

B. In locations other than those specified, extend gypsum board from floor to heights as follows:

1. Not less than 100 mm (4 inches) above suspended acoustical ceilings.
2. At ceiling of suspended gypsum board ceilings.
3. At existing ceilings.

3.2 INSTALLING GYPSUM BOARD

A. Coordinate installation of gypsum board with other trades and related work.

B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.

C. Moisture and Mold-Resistant Assemblies: Provide and install moisture and mold-resistant glass mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 where shown and in locations which might be subject to moisture exposure during construction.

D. Use gypsum boards in maximum practical lengths to minimize number of end joints.

E. Bring gypsum board into contact, but do not force into place.

F. Ceilings:

1. For single-ply construction, use perpendicular application.

G. Walls (Except Shaft Walls):

1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
3. Stagger screws on abutting edges or ends.
4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of

wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.

6. For three-ply gypsum board assemblies, apply plies in same manner as for two-ply assemblies, except that heads of fasteners need only be driven flush with surface for first and second plies. Apply third ply of wallboard in same manner as second ply of two-ply assembly, except use fasteners of sufficient length enough to have the same penetration into framing members as required for two-ply assemblies.
7. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
8. Installing Two Layer Assembly Over Sound Deadening Board:
   a. Apply face layer of wallboard vertically with joints staggered from joints in sound deadening board over framing members.
   b. Fasten face layer with screw, of sufficient length to secure to framing, spaced 300 mm (12 inches) on center around perimeter, and 400 mm (16 inches) on center in the field.
9. Control Joints ASTM C840 and as follows:
   a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
   b. Not required for wall lengths less than 9000 mm (30 feet).
   c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.

H. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:
1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.

I. Electrical and Telecommunications Boxes:
1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.

J. Accessories:
1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.

2. Install in one piece, without the limits of the longest commercially available lengths.
3. Corner Beads:
   a. Install at all vertical and horizontal external corners and where shown.
   b. Use screws only. Do not use crimping tool.
4. Edge Trim (casings Beads):
   a. At both sides of expansion and control joints unless shown otherwise.
   b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
   c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
   d. Where shown.

3.4 CAVITY SHAFT WALL

A. Coordinate assembly with Section 09 22 16, NON-STRUCTURAL METAL FRAMING, for erection of framing and gypsum board.
B. Conform to UL Design No. U438 or FM WALL CONSTRUCTION 12-2/HR (Nonbearing for two-hour fire rating. Conform to FM WALL CONSTRUCTION 25-1/HR (Non-loadbearing) for one-hour fire rating where shown.
C. Cut coreboard (liner) panels 25 mm (one inch) less than floor-to-ceiling height, and erect vertically between J-runners on shaft side.
   1. Where shaft walls exceed 4300 mm (14 feet) in height, position panel end joints within upper and lower third points of wall.
   2. Stagger joints top and bottom in adjacent panels.
   3. After erection of J-struts of opening frames, fasten panels to J-struts with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
D. Gypsum Board:
   1. Two hour wall:
      a. Erect base layer (backing board) vertically on finish side of wall with end joints staggered. Fasten base layer panels to studs with 25 mm (one inch) long screws, spaced 600 mm (24 inches) on center.
      b. Use laminating adhesive between plies in accordance with UL or FM if required by fire test.
      c. Apply face layer of gypsum board required by fire test vertically over base layer with joints staggered and attach with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.

2. One hour wall with one layer on finish side of wall: Apply face layer of gypsum board vertically. Attach to studs with screws of sufficient length to secure to framing, spaced 300 mm (12 inches) on center in field and along edges.
3. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.

E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.

3.5 FINISHING OF GYPSUM BOARD

A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 5 finish for al finished areas open to public view.

B. Before proceeding with installation of finishing materials, assure the following:
   1. Gypsum board is fastened and held close to framing or furring.
   2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.

C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of non decorated smoke barrier, fire rated and gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier and fire rated construction. Sanding is not required of non decorated surfaces.

3.6 REPAIRS

A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.

B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.

C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.

D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non decorated surfaces.

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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 and suspension system: See Finish Schedule on the Drawings.

1.3 SUBMITTAL

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

B. Samples:

1. Acoustical units, each type, with label indicating conformance to specification requirements.
2. Colored markers for units providing access.

C. Manufacturer's Literature and Data:

1. Ceiling suspension system, each type, showing complete details of installation, including suspension system specified to match existing and upward access system details for grid system(s).
2. Acoustical units, each type

D. Manufacturer's Certificates: Acoustical units, each type, in accordance with specification requirements.

1.4 DEFINITIONS

A. Standard definitions as defined in ASTM C634.

B. Terminology as defined in ASTM E1264.

1.5 APPLICABLE PUBLICATIONS

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

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

A641/A641M-03.....Zinc-coated (Galvanized) Carbon Steel Wire

A653/A653M-07.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process

C423-07.....Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

C634-02 (E2007).....Standard Terminology Relating to Environmental Acoustics

C635-04.....Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
C636-06.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
E84-07.....Surface Burning Characteristics of Building Materials
E119-07.....Fire Tests of Building Construction and Materials
E413-04.....Classification for Rating Sound Insulation.
E580-06.....Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint
E1264-(R2005).....Classification for Acoustical Ceiling Products

PART 2- PRODUCTS

2.1 METAL SUSPENSION SYSTEM

A. ASTM C635, heavy-duty system, except as otherwise specified.
   1. Ceiling suspension system members may be fabricated from either of the following unless specified otherwise.
      a. Galvanized cold-rolled steel, bonderized.
      b. Extruded aluminum.
   2. Use same construction for cross runners as main runners. Use of lighter-duty sections for cross runners is not acceptable.
B. Exposed grid suspension system for support of lay-in panels:
   1. Exposed grid width not less than 22 mm (7/8 inch) with not less than 8 mm (5/16 inch) panel bearing surface.
   2. Fabricate wall molding and other special molding from the same material with same exposed width and finish as the exposed grid members.
   3. On exposed metal surfaces apply baked-on enamel flat texture finish in manufacturer’s standard” white” color.

2.2 PERIMETER SEAL

A. Vinyl, polyethylene or polyurethane open cell sponge material having density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.
B. Thickness as required to fill voids between back of wall molding and finish wall.
C. Not less than 9 mm (3/8 inch) wide strip.

2.3 WIRE

A. ASTM A641.
B. For wire hangers: Minimum diameter 2.68 mm (0.1055 inch).

C. For bracing wires: Minimum diameter 3.43 mm (0.1350 inch).

2.4 ANCHORS AND INSERTS

A. Use anchors or inserts to support twice the loads imposed by hangers attached thereto.

B. Hanger Inserts:

1. Fabricate inserts from steel, zinc-coated (galvanized after fabrication).

C. Clips:

1. Galvanized steel.
2. Designed to clamp to steel beam or bar joists, or secure framing member together.
3. Designed to rigidly secure framing members together.
4. Designed to sustain twice the loads imposed by hangers or items supported.

D. Tile Splines: ASTM C635.

2.5 CARRYING CHANNELS FOR SECONDARY FRAMING

A. Fabricate from cold-rolled or hot-rolled steel, black asphaltic paint finish, free of rust.

B. Weighing not less than the following, per 300 m (per thousand linear feet):

Size mm	Size Inches	Cold-rolled		Hot-rolled	
		Kg	Pound	Kg	Pound
38	1 1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

2.6 ACOUSTICAL UNITS

A. General:

1. ASTM E1853, weighing 1.20 lbs./SF minimum for mineral fiber panels or tile.
2. Class A Flame Spread: ASTM 84. Flame Spread Index 25 or less.
3. Minimum NRC (Noise Reduction Coefficient): 0.55 unless specified otherwise: ASTM C423.
4. Minimum CAC (Ceiling Attenuation Class): 35.
5. Manufacturers standard finish, minimum Light Reflectance (LR) coefficient of 0.83 on the exposed surfaces.
6. Lay-in panels: ASTM E1264 Class, sizes as shown, with Angled Tegular edges.

B. Type III – Wet formed mineral fiber base with factory applied water-based painted finish less than 10 g/l VOC, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick.

C. "Humiguard Plus" sag resistance.

D. Average R Factor: 1.6 BTU units.

E. Manufacturer applied Anti-Mold/Mildew and Bacteria Resistance.

F. NRC: 0.50.

G. Recycled Content: Up to 46%.

2.7 ACCESS IDENTIFICATION

A. Markers:

1. Use colored markers with pressure sensitive adhesive on one side.
2. Make colored markers of paper of plastic, 6 to 9 mm (1/4 to 3/8 inch) in diameter.

B. Use markers of the same diameter throughout building.

C. Color Code: Use following color markers for service identification:

Color.....Service
Red.....Sprinkler System: Valves and Controls
Green.....Domestic Water: Valves and Controls
Yellow.....Chilled Water and Heating Water
Orange.....Ductwork: Fire Dampers
Blue.....Ductwork: Dampers and Controls
Black.....Gas: Laboratory, Medical, Air and Vacuum

PART 3 EXECUTION

3.1 CEILING TREATMENT

A. Treatment of ceilings shall include sides and soffits of ceiling beams, furred work 600 mm (24 inches) wide and over, and vertical surfaces at changes in ceiling heights unless otherwise shown. Install acoustic tiles after wet finishes have been installed and solvents have cured.

B. Lay out acoustical units symmetrically about center lines of each room or space unless shown otherwise on reflected ceiling plan.

C. Moldings:

1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.

D. Perimeter Seal:

1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.

2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

E. Existing ceiling:

1. Where extension of existing ceilings occur, match existing.
2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units within a space which results in contrast between old and new acoustic units.
3. Comply with specifications for new acoustical units for new units required to match appearance of existing units.

3.2 CEILING SUSPENSION SYSTEM INSTALLATION

A. General:

1. Install metal suspension system for acoustical tile and lay-in panels in accordance with ASTM C636, except as specified otherwise.
2. Use direct or indirect hung suspension system or combination thereof as defined in ASTM C635.
3. Support a maximum area of 1.48 m^2 (16 sf) of ceiling per hanger.
4. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
5. Provide extra hangers, minimum of one hanger at each corner of each item of mechanical, electrical and miscellaneous equipment supported by ceiling suspension system not having separate support or hangers.
6. Provide not less than 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown,
7. Use main runners not less than 1200 mm (48 inches) in length.
8. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.

B. Anchorage to Structure:

1. Concrete:
   a. Install hanger inserts and wire loops required for support of hanger // and bracing // wire in concrete forms before concrete is placed. Install hanger wires with looped ends through steel deck if steel deck does not have attachment device.
   b. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger // and bracing // wire. Install in sides of concrete beams or joists at mid height.
2. Steel:

a. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels for attachment of hanger wires.
   (1) Size and space carrying channels to insure that the maximum deflection specified will not be exceeded.
   (2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.
b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fire proofing is installed. Weld or use steel clips to attach to beam to develop full strength of carrying channel.
c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of the bottom chord of the bar joists, and securely wire tie or clip to joist.

C. Direct Hung Suspension System:
   1. As illustrated in ASTM C635.
   2. Support main runners by hanger wires attached directly to the structure overhead.
   3. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.

D. Indirect Hung Suspension System:
   1. As illustrated in ASTM C635.
   2. Space carrying channels for indirect hung suspension system not more than 1200 mm (4 feet) on center. Space hangers for carrying channels not more than 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) or center so as to insure that specified requirements are not exceeded.
   3. Support main runners by specially designed clips attached to carrying channels.

E. Seismic Ceiling Bracing System:
   1. Construct system is accordance with ASTM E580.
   2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner or carrying channels of suspended ceiling at bottom.

3.3 ACOUSTICAL UNIT INSTALLATION

A. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.

B. Install lay-in acoustic panels in exposed grid with not less than 6 mm (1/4 inch) bearing at edges on supports.

1. Install tile to lay level and in full contact with exposed grid.
2. Replace cracked, broken, stained, dirty, or tile not cut for minimum bearing.

C. Markers:

1. Install markers of color code specified to identify the various concealed piping, mechanical, and plumbing systems.
2. Attach colored markers to exposed grid on opposite sides of the units providing access.
3. Attach marker on exposed ceiling surface of upward access acoustical unit.

3.4 CLEAN-UP AND COMPLETION

A. Replace damaged, discolored, dirty, cracked and broken acoustical units.

B. Leave finished work free from defects.

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SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the installation of rubber base.

1.2 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Description of each product.
2. Base material manufacturer's recommendations for adhesives.
3. Application and installation instructions.

C. Samples:

1. Base: 150 mm (6 inches) long, each type and color.

1.3 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.

1.4 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.

1.5 APPLICABLE PUBLICATIONS

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

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

F1861-08.....Resilient Wall Base

PART 2 - PRODUCTS

2.1 GENERAL

Use only products by the same manufacturer and from the same production run.

2.2 RESILIENT BASE

A. ASTM F1861, 3 mm (1/8 inch) thick, 100 mm (4 inches) high, Thermoplastics, Group 2-layered. Style B-cove.

C. Use only one type of base throughout.

2.3 PRIMER (FOR CONCRETE FLOORS)

As recommended by the adhesive and tile manufacturer.

2.4 LEVELING COMPOUND (FOR CONCRETE FLOORS)

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

2.5 ADHESIVES

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

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

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

3.2 INSTALLATION REQUIREMENTS

A. The respective manufacturer's instructions for application and installation will be considered for use when approved by the Resident Engineer.
B. Submit proposed installation deviation from this specification to the Resident Engineer indicating the differences in the method of installation.
C. The Resident Engineer reserves the right to have test portions of material installation removed to check for non-uniform adhesion and spotty adhesive coverage.

3.3 PREPARATION

A. Examine surfaces on which material is to be installed.
B. Fill cracks, pits, and dents with leveling compound.
C. Level to 3 mm (1/8 inch) maximum variations.
D. Do not use adhesive for leveling or filling.
E. Grind, sand, or cut away protrusions; grind high spots.
F. Clean substrate area of oil, grease, dust, paint, and deleterious substances.
G. Substrate area dry and cured. Perform manufacturer’s recommended bond and moisture test.
H. Preparation of existing installation:
   1. Remove existing base including adhesive.

2. Do not use solvents to remove adhesives.
3. Prepare substrate as specified.

3.4 BASE INSTALLATION

A. Location:
1. Unless otherwise specified or shown, where base is scheduled, install base over toe space of base of casework, lockers, laboratory, pharmacy furniture island cabinets and where other equipment occurs.
2. Extend base scheduled for room into adjacent closet, alcoves, and around columns.

B. Application:
1. Apply adhesive uniformly with no bare spots.
2. Set base with joints aligned and butted to touch for entire height.
3. Before starting installation, layout base material to provide the minimum number of joints with no strip less than 600 mm (24 inches) length.
   a. Short pieces to save material will not be permitted.
   b. Locate joints as remote from corners as the material lengths or the wall configuration will permit.

C. Form corners and end stops as follows:
1. Score back of outside corner.
2. Score face of inside corner and notch cove.

D. Roll base for complete adhesion.

3.5 CLEANING AND PROTECTION

A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets.

B. Keep traffic off resilient material for at least 72 hours after installation.

C. Clean and polish materials in the following order:
1. After two weeks, scrub resilient base with a minimum amount of water and a mild detergent. Leave surfaces clean and free of detergent residue. Polish resilient base to a gloss finish.
2. Do not polish tread and sheet rubber materials.

D. When construction traffic is anticipated, cover tread materials with reinforced kraft paper and plywood or hardboard properly secured and maintained until removal is directed by the Resident Engineer.

E. Where protective materials are removed and immediately prior to acceptance, replace damaged materials and re-clean resilient materials. Damaged materials are defined as having cuts, gouges, scrapes or tears and not fully adhered.

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SECTION 09 65 16
RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies the installation of sheet flooring with integral cove base.

B. Provide resilient sheet vinyl floor covering with highly compressed homogeneous vinyl wear layer, a high performance urethane top coat, glass fiber interlayer backing and calendared CDF backing.

C. Installation of sheet flooring includes the following:

1. Heat welded seams.
2. Integral cove base: Installed at intersection of floor and vertical surfaces.

1.2 RELATED WORK

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

B. Resilient base over base of equipment and casework: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

1.3 QUALITY CONTROL-QUALIFICATIONS:

A. The Contracting Officer shall approve products or service of proposed manufacturer, suppliers, and installers, and the Contractor shall submit certification that:

1. Heat welded seaming is manufacturer's prescribed method of installation.
2. Installer is approved by manufacturer of materials and has technical qualifications, experience, trained personnel, and facilities to install specified items.
3. Manufacturer's product submitted has been in satisfactory operation, on three installations similar and equivalent in size to this project for three years. Submit list of installations.

B. The sheet vinyl floor coverings shall meet fire performance characteristics as determined by testing products, per ASTM test method, indicated below by Underwriters Laboratories, Inc. (UL) or another recognized testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.
2. Smoke Density: Less than 450 per ASTM E662.

C. The floor covering manufacturer shall certify that products supplied for installation comply with local regulations controlling use of volatile organic compounds (VOC’s).

1.4 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, submit following:

B. Manufacturer's Literature and Data:

1. Description of resilient material and accessories to be provided.
2. Resilient material manufacturer's recommendations for adhesives, weld rods, sealants, and underlayment.
3. Application and installation instructions.

C. Samples:

1. Sheet material, 38 mm by 300 mm (1-1/2 inch by 12 inch), of each color and pattern with a welded seam using proposed welding rod 300 mm (12 inches) square for each type, pattern and color.
2. Cap strip and fillet strip, 300 mm (12 inches) for integral base.
3. Shop Drawings and Certificates: Layout of joints showing patterns where joints are expressed, and type and location of obscure type joints. Indicate orientation of directional patterns.
4. Certificates: Quality Control Certificate Submittals and lists specified in paragraph, QUALIFICATIONS.
5. Edge strips: 150 mm (6 inches) long each type.
6. Adhesive, underlayment and primer: Pint container, each type.

1.5 PROJECT CONDITIONS

A. Maintain temperature of floor materials and room, where work occurs, above 18 ° C (65 °F) and below 38 °C (100 °F) for 48 hours before, during and for 48 hours after installation. After above period, room temperature shall not fall below 13 °C (55 °F).

B. Construction in or near areas to receive flooring work shall be complete, dry and cured. Do not install resilient flooring over slabs until they have been cured and are sufficiently dry to achieve a bond with adhesive. Follow flooring manufacturer’s recommendations for bond and moisture testing.

C. Building shall be permanently enclosed. Schedule construction so that floor receives no construction traffic when completed.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site in original sealed packages or containers; labeled for identification with manufacturer's name and brand.

B. Deliver sheet flooring full width roll, completely enclosed in factory wrap, clearly marked with the manufacturer's number, type and color, production run number and manufacture date.

C. Store materials in weathertight and dry storage facility. Protect from damage due to handling, weather, and construction operations before,

during and after installation. Store sheet flooring on end with ambient temperatures maintained as recommended by manufacturer.

D. Store sheet flooring on end.

E. Move sheet vinyl floor coverings and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.7 APPLICABLE PUBLICATIONS

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

B. American Society For Testing Materials (ASTM):

E648-09.....Critical Radiant Flux of Floor-Covering Systems Using a Radiant Energy Source.

E662-09.....Specific Optical Density of Smoke Generated by Solid Materials.

F710-08.....Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

F1303-04.....Sheet Vinyl Floor Covering with Backing.

F1869-04.....Moisture Vapor Emission Rate of Concrete Subfloor using Anhydrous Calcium Chloride

F1913-04.....Sheet Vinyl Flooring without Backing

F2170-09.....Determining Relative Humidity in Concrete Floor Slabs using In-situ Probes

C. Resilient Floor Covering Institute (RFCI):

Recommended Work Practices for Removal of Resilient Floor Coverings.

1.8 SCHEDULING

Interior finish work such as plastering, drywall finishing, concrete, terrazzo, ceiling work, and painting work shall be complete and dry before installation. Mechanical, electrical, and other work above ceiling line shall be completed. Heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

1.9 WARRANTY:

Submit written warranty, in accordance with FAR clause 52.246-21, Warranty of Construction requirements except that warranty period shall be extended to include two (2) years.

PART 2 - PRODUCTS

2.1 SHEET VINYL FLOOR COVERINGS

A. Sheet Vinyl Floor Coverings: Smooth face, minimum thickness nominal

2 mm (0.08 inch). Sheet flooring shall conform to ASTM F1913 and material requirements specified in ASTM F1303, Type II, Grade 1, backing classification not applicable. Foam backed sheet flooring is not acceptable.

B. Size: Provide maximum size sheet vinyl material produced by manufacturer to provide minimum number of joints. Minimum size width acceptable - 1200 mm (48 inches).

C. Each color and pattern of sheet flooring shall be of same production run.

2.2 WELDING ROD:

Product of floor covering manufacturer in color shall match field color of sheet vinyl covering.

2.3 APPLICATION MATERIALS AND ACCESSORIES

A. Floor and Base Adhesive: Type recommended by sheet flooring material manufacturer for conditions of use.

B. Mastic Underlayment (for concrete floors): Provide products with latex or polyvinyl acetate resins in mix. Condition to be corrected shall determine type of underlayment selected for use.

C. Base Accessories:

1. Fillet Strip: 19 mm (3/4 inch) radius fillet strip compatible with resilient sheet material.
2. Cap Strip: Extruded flanged zero edge vinyl reducer strip approximately 25 mm (one inch) exposed height with 13 mm (1/2 inch) flange.

2.4 SHEET FLOORING

A. ASTM F1303, Type I, Grade 1, Class B backing.

B. Minimum nominal thickness 2 mm (0.08 inch); Roll width 2 m (79 inches). Roll length 25 m, (82 lineal feet).

C. Critical Radiant Flux: Class I, per ASTM E648/NFPA 253-Class 1.

D. Smoke density: less than 450 per ASTM E662.

E. Color and pattern of sheet flooring of the same production run.

2.5 ADHESIVES

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

2.6 BASE CAP STRIP AND COVE STRIP

A. Extruded vinyl compatible with the sheet flooring.

B. Cap strip "J" shape with feathered edge flange approximately 25 mm (one inch) wide; top designed to receive sheet flooring with 13 mm (1/2 inch) flange lapping top of flooring

C. Cove strip 70 mm (2-3/4 inch) radius.

2.7 LEVELING COMPOUND (FOR CONCRETE FLOORS)

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

2.8 PRIMER (FOR CONCRETE SUBFLOORS)

As recommended by the adhesive or sheet flooring manufacturer.

2.9 EDGE STRIPS

A. Extruded aluminum, mill finish, mechanically cleaned.
B. 28 mm (1-l/8 inch) wide, 6 mm (1/4 inch) thick, bevel one edge to 3 mm (1/8 inch) thick.
C. Drill and counter sink edge strips for flat head screws. Space holes near ends and approximately 225 mm (9 inches) on center in between.

2.10 SEALANT

A. As specified in Section 07 92 00, JOINT SEALANTS.
B. Compatible with sheet flooring.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

A. Maintain temperature of sheet flooring above 36 °C (65 °F), for 48 hours before installation.
B. Maintain temperature of rooms where sheet flooring work occurs above 36 °C (65 °F), for 48 hours, before installation and during installation.
C. After installation, maintain temperature at or above 36 °C (65 °F.)
D. Building is permanently enclosed.
E. Wet construction in or near areas to receive sheet flooring is complete, dry and cured.

3.2 SUBFLOOR PREPARATION

A. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710.
   1. Installer shall examine surfaces on which resilient sheet flooring is to be installed, and shall advise Contractor, in writing, of areas which are unacceptable for installation of flooring material. Installer shall advise Contractor which methods are to be used to correct conditions that will impair proper installation. Installation shall not proceed until unsatisfactory conditions have been corrected.
   2. Slab substrates dry, free of curing compounds, sealers, hardeners, and other materials which would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by Resilient Floor Covering Institute recommendations in manual RFCI-MRP.

B. Broom or vacuum clean substrates to be covered by sheet vinyl floor coverings immediately before installation. Following cleaning, examine substrates to determine if there is visually any evidence of moisture, alkaline salts, carbonation, or dust.

C. Primer: If recommended by flooring manufacturer, prior to application of adhesive, apply concrete slab primer in accordance with manufacturer's directions.

D. Correct conditions which will impair proper installation, including trowel marks, pits, dents, protrusions, cracks or joints.

E. Fill cracks, joints, depressions, and other irregularities in concrete with leveling compound.
   1. Do not use adhesive for filling or leveling purposes.
   2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
   3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joint lines.

F. Clean floor of oil, paint, dust and deleterious substances. Leave floor dry and cured free of residue from existing curing or cleaning agents.

G. Moisture Testing: Perform moisture and pH test as recommended by the flooring and adhesive manufacturers. Perform test locations starting on the deepest part of the concrete structure. Proceed with installation only after concrete substrates meet or exceed the manufacturer's requirements. In the absence of specific guidance from the flooring or adhesive manufacturer the following requirements are to be met:
   1. Perform moisture vapor emission tests in accordance with ASTM F1869. Proceed with installation only after substrates have a maximum moisture-vapor-emission rate of 1.36 kg of water/92.9 sq. m (3lb of water/1000 sq. ft.) in 24 hours.
   2. Perform concrete internal relative humidity testing using situ probes in accordance with ASTM F2170. Proceed with installation only after concrete reaches maximum 75 percent relative humidity level measurement.

H. Preparation shall include the removal of existing resilient floor and existing adhesive. Do not use solvents to remove adhesives.

I. Remove existing resilient flooring and adhesive completely in accordance with Resilient Floor Covering Institute recommendations in manual RFCI-WP. Solvents shall not be used.

3.3 INSTALLATION OF FLOORING

A. Install work in strict compliance with manufacturer's instructions and approved layout drawings.

B. Maintain uniformity of sheet vinyl floor covering direction and avoid cross seams.
C. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas, but in no case less than 150 mm (6 inches) away from parallel joints in flooring substrates.
D. Match edges of resilient floor coverings for color shading and pattern at seams.
E. Where resilient sheet flooring abuts other flooring material floors shall finish level.
F. Extend sheet vinyl floor coverings into toe spaces, door reveals, closets, and similar openings.
G. Inform the Resident Engineer of conflicts between this section and the manufacturer's instructions or recommendations for auxiliary materials, or installation methods, before proceeding.
H. Install sheet in full coverage adhesives.
   1. Air pockets or loose edges will not be accepted.
   2. Trim sheet materials to touch in the length of intersection at pipes and vertical projections; seal joints at pipe with waterproof cement or sealant.
I. Keep joints to a minimum; avoid small filler pieces or strips.
J. Follow manufacturer’s recommendations for seams at butt joints. Do not leave any open joints that would be readily visible from a standing position.
K. Follow manufacturer’s recommendations regarding pattern match, if applicable.
L. Installation of Edge Strips:
   1. Locate edge strips under center lines of doors unless otherwise indicated.
   2. Set aluminum strips in adhesive, anchor with lead anchors and stainless steel Phillips screws.
M. Integral Cove Base Installation:
   1. Set preformed fillet strip to receive base.
   2. Install the base with adhesive, terminate expose edge with the cap strip.
   3. Form internal and external corners to the geometric shape generated by the cove at either straight or radius corners.
   4. Solvent weld joints as specified for the flooring. Seal cap strip to wall with an adhesive type sealant.
   5. Unless otherwise specified or shown where sheet flooring is scheduled, provide integral base at intersection of floor and

vertical surfaces. Provide sheet flooring and base scheduled for room on floors and walls under and behind areas where casework, laboratory and pharmacy furniture and other equipment occurs, except where mounted in wall recesses.

3.4 INSTALLATION OF INTEGRAL COVED BASE

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

B. Internal and external corners shall be formed to geometric shape generated by cove at either square or radius corners.

3.5 WELDING

A. Heat weld all joints of flooring and base using equipment and procedures recommended by flooring manufacturer.

B. Welding shall consist of routing joint, inserting a welding rod into routed space, and terminally fusing into a homogeneous joint.

C. Upon completion of welding, surface across joint shall finish flush, free from voids, and recessed or raised areas.

D. Fusion of Material: Joint shall be fused a minimum of 65 percent through thickness of material, and after welding shall meet specified characteristics for flooring.

3.6 CLEANING

A. Clean small adhesive marks during application of sheet flooring and base before adhesive sets, excessive adhesive smearing will not be accepted.

B. Remove visible adhesive and other surface blemishes using methods and cleaner recommended by floor covering manufacturers.

C. Clean and polish materials per flooring manufacturer’s written recommendations.

D. Vacuum floor thoroughly.

E. Do not wash floor until after period recommended by floor covering manufacturer and then prepare in accordance with manufacturer’s recommendations.

F. Upon completion, Resident Engineer shall inspect floor and base to ascertain that work was done in accordance with manufacturer's printed instructions.

G. Perform initial maintenance according to flooring manufacturer’s written recommendations.

3.7 PROTECTION:

A. Protect installed flooring as recommended by flooring manufacturer against damage from rolling loads, other trades, or placement of fixtures and furnishings.

B. Keep traffic off sheet flooring for 24 hours after installation.

C. Where construction traffic is anticipated, cover sheet flooring with reinforced kraft paper properly secured and maintained until removal is authorized by the Resident Engineer.

D. Where protective materials are removed and immediately prior to acceptance, repair any damage, re-clean sheet flooring, lightly re-apply polish and buff floor.

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SECTION 09 67 23.60
RESINOUS (URETHANE AND EPOXY MORTAR) FLOORING (RES-6)

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies Resinous (Resinous urethane mortars) flooring with integral cove base.
   1. Low odor, self-leveling slurryand Sealed Urethane Mortar Flooring System.

1.2 RELATED WORK

A. Concrete and Moisture Vapor Barrier: Section 03 30 00, CAST-IN-PLACE CONCRETE.
B. Floor Drains: Division 22, PLUMBING.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
   1. Description of each product to be provided.
   2. Application and installation instructions.
   3. Maintenance Instructions: Submit manufacturer’s written instructions for recommended maintenance practices.
C. Qualification Data: For Installer.
D. Sustainable Submittal:
   1. Product data for products having recycled content, submit documentation indicating percentages by weight of postconsumer and pre consumer recycled content.
      a. Include statements indicating costs for each product having recycled content, and low emitting materials.
   2. Product data for Environmental Quality Credit EQ 4.2 low emitting materials, include printed statement of VOC content indicating compliance with environmental requirements.
   3. Product data for Material Resource Credit MR 4.1, 12%-35% post-consumer recycled glass content.
   4. Product data for Material Resource Credit MR 6, renewable resin.
   5. Product data for field applied, interior, paints, coatings, and primers, include printed statement of VOC content indicating compliance with environmental requirements.
E. Samples:
   1. Samples for verification: For each (color and texture) resinous flooring system required, 6 inches (152 mm) square, applied to a rigid backing by installer for this project.

2. Sample showing construction from substrate to finish surface in thickness specified and color and texture of finished surfaces. Finished flooring must match the approved samples in color and texture.

F. Shop Drawings: Include plans, sections, component details, and attachment to other trades. Indicate layout of the following:
1. Patterns.
2. Edge configurations.

G. Certifications and Approvals:
1. Manufacturer's certification of material and substrate compliance with specification.
2. Manufacturer's approval of installer.
3. Contractor's certificate of compliance with Quality Assurance requirements.

H. Warranty: As specified in this section.

1.4 QUALITY ASSURANCE

A. Manufacture Certificate: Manufacture shall certify that a particular resinous flooring system has been manufactured and in use for a minimum of five (5) years.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this project for a minimum period of five (5) years, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
2. Contractor shall have completed at least five (5) projects of similar size and complexity. Include list of at least five (5) projects. List must include owner (purchaser); address of installation, contact information at installation project site; and date of installation.
3. Installer's Personnel: Employ persons trained for application of specified product.

C. Source Limitations:
1. Obtain primary resinous flooring materials including primers, resins, hardening agents, grouting coats and finish or sealing coats from a single manufacturer.

2. Provide secondary materials, including patching and fill material, joint sealant, and repair material of type and from source recommended by manufacturer of primary materials.

D. Pre-Installation Conference:
1. Convene a meeting not less than thirty days prior to starting work.
2. Attendance:
   a. Contractor
   b. Resident Engineer
   c. Manufacturer and Installer's Representative
3. Review the following:
   a. Environmental requirements
      1) Air and surface temperature
      2) Relative humidity
      3) Ventilation
      4) Dust and contaminates
   b. Protection of surfaces not scheduled to be coated
   c. Inspect and discus condition of substrate and other preparatory work performed
   d. Review and verify availability of material; installer’s personnel, equipment needed
   e. Designs, patterns and edge conditions.
   f. Performance of the coating with chemicals anticipated in the area receiving the resinous (urethane and epoxy mortar/cement) flooring system
   g. Application and repair
   h. Field quality control
   i. Cleaning
   j. Protection of coating systems
   k. One-year inspection and maintenance
   l. Coordination with other work

E. Manufacturer’s Field Services: Manufacturer’s representative shall provide technical assistance and guidance for surface preparation and application of resinous flooring systems.

F. Contractor Job Site Log: Contractor shall document daily; the work accomplished environmental conditions and any other condition event significant to the long term performance of the urethane and epoxy mortar/cement flooring materials installation. The Contractor shall maintain these records for one year after Substantial Completion.

G. Volatile Organic Compound content to remain under 100g/liter.

1.5 MATERIAL PACKAGING DELIVERY AND STORAGE

A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
B. Protect materials from damage and contamination in storage or delivery, including moisture, heat, cold, direct sunlight, etc.
C. Maintain temperature of storage area between 60 and 80 degrees F (15 and 26 degrees C).
D. Keep containers sealed until ready for use.
E. Do not use materials beyond manufacturer’s shelf life limits.
F. Package materials in factory pre-weighed and in single, easy to manage batches sized for ease of handling and mixing proportions from entire package or packages. No On site weighing or volumetric measurements are allowed.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring applications.
B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.
D. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

1.7 WARRANTY

A. Warranty: Manufacture shall furnish a single, written warranty covering the full assembly (including substrata) for both material and workmanship for a extended period of three (3) full years from date of installation, or provide a joint and several warranty signed on a single document by manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of three (3) full years from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

1.8 APPLICABLE PUBLICATIONS

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

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

B221-08.....Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

C307-03 (2008).....Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings

C413-01(2006).....Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes

C579-01(2006).....Standard Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

C580-02(2008).....Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

C811-98(2008).....Standard Practice for Surface Preparation of Concrete for Application of Chemical-Resistant Resin Monolithic Surfacings

D2047-04 .....Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine

D2240-05.....Standard Test Method for Rubber Property — Durometer Hardness

D4060-07.....Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser

F1869-09.....Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

F2170-09.....Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

C. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 501.....Finishes for Aluminum

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION FOR RESINOUS FLOORING AND BASE

A. System Descriptions:

1. Primer as required by Manufacturer.
2. Basis-of-Design Flexible Epoxy Membrane (Undercoat): EPO-FLEX 3552 manufactured by General Polymers for Sherwin Williams.
3. Basis-of-Design Slurry and Broadcast: Number 5050 "FasTop "S" Urethane Slurry System manufactured by General Polymers for Sherwin Williams. System shall be low odor, self-leveling slurry to be applied at 3/16" thickness and broadcast to yield a ¼" to 3/8" finished system with 5900F Upgrade Ceramic Blend Broadcast.
4. Basis-of-Design Seal Coat: Number 3744 Seal Coat.
5. Basis-of-Design Cove Base: Number 5055 Epoxy Cove Base System as manufactured by General Polymers for Sherwin Williams, ¼" thickness, six inches high or as otherwise shown on the Drawings. Base shall consist of Primer 3561V, Binder Resin 3561V, Aggregate blend, Grout Coat 3744G, and Seal Coat 3744.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.

C. Application Information:

1. Primer as required by Manufacturer.
2. Flexible Epoxy Membrane (Undercoat):
   a. Number of coats: one.
   c. Application Method: Squeegee.
   d. Thickness of Coat: Yield 20 mils WFT.
3. Slurry and Undercoat:
   a. 1/4" Slurry and broadcast system
   b. Number of Coats: one.
   c. Broadcast Method: Pin rake, screed rake or flat trowel.
   d. Broadcast Layer: About 400 lbs. per 1000 sq. ft.
   e. Thickness of Coat: 1/4" to 3/8"
4. Cove Base: 30 lbs. per coat
5. Seal Coat: 100 s.f./gallon.

D. Physical Properties:

1. Physical Properties of flooring system when tested as follows:

Property	Test	Value
Compressive Strength	ASTM C579	5,000 psi after 7 days
Tensile Strength	ASTM C307	1,000 psi
Flexural Strength	ASTM C580	2,400 psi
Water Absorption	ASTM C413	0.056%
Coefficient of friction dry/slip index wet	ASTM D2047	>1.0 dry >1.0 wet
Impact Resistance	ASTM D4226	> 160 in. lbs
Abrasion Resistance	ASTM D4060	0.05 gm maximum weight loss
Thermal Coefficient of Linear Expansion	ASTM C531	1.1×10^{-5} mm/ °C mm
Hardness Shore D	ASTM D2240	80 to 84
Bond Strength	ASTM D7234	>300 psi 100% concrete failure
Chemical Resistance of the following:	ASTM D1308	No Effect
Acetic acid	5 percent	
Ammonium hydroxide	10 percent	
Citric Acid	50 percent	
Fatty acid Motor Oil, 20W		
Hydrochloric acid	10 percent	
Salt water		
Sodium Hydroxide	10 percent	
Sulfuric acid	10 percent	
Trisodium phosphate	5 percent	
Urine		
Feces		
Hydrogen peroxide	28 percent	
Distilled Water		
Sodium Hypochloride	5.28 percent	

2.2 SUPPLEMENTAL MATERIALS

A. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service or joint conditioned indicated.

B. Patching and Fill Material: Resinous product of or approved by resinous coating manufacturer for application indicated. Resinous based materials only. Cementitious or single component product are not expectable//.

2.3 TROWELED COVE BASE

Same physical properties as specified resinous mortar system.

2.4 BASE CAP STRIP

A. Aluminum, Extruded: ASTM B221, Alloy 6063-T6.

B. Shape for 3/16 inch (4.76 mm) depth of base material, "J" configuration.

C. Finish:
   1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
   2. Aluminum: NAAMM Amp 501:
      a. Clear anodic coating, AA-C22A41 chemically etched medium matte, with Architectural Class 1, 0.7 mils (0.018 mm) or thicker.

D. Stainless steel fit head screws.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where monolithic resinous (urethane mortar) flooring system with integral base is to be installed with the VA Resident Engineer.

B. Moisture Vapor Emission Testing: Perform moisture vapor transmission testing in accordance with ASTM F1869 to determine the MVER of the substrate prior to commencement of the work. See section 3.4, 3.

3.2 PROJECT CONDITIONS

A. Maintain temperature of rooms (air and surface) where work occurs, between 70 and 90 degrees F (21 and 32 degrees C) for at least 48 hours, before, during, and 24 hours after installation. Maintain temperature at least 70 degrees F (21 degrees C) during cure period.

B. Maintain relative humidity less than 75 percent.

C. Do not install materials until building is permanently enclosed and wet construction is complete, dry, and cured.

D. Maintain proper ventilation of the area during application and curing time period.
   1. Comply with infection control measures of the VA Medical Center.

3.3 INSTALLATION REQUIREMENTS

A. The manufacturer's instructions for application and installation shall be reviewed with the VA Resident Engineer for the seamless resinous (urethane and epoxy mortar) flooring system with integral cove base.

B. Substrate shall be approved by manufacture technical representative.

3.4 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
   1. Prepare concrete substrates as follows:

a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and re circulates the shot by vacuum pickup.
b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent. Use of acids is never allowed.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
3. Verify that concrete substrates are dry.
   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of [**5 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)** in 24 hours.
   b. MVT threshold for monolithic resinous Non - climatic flooring shall not exceed 5 lbs/1000 square feet (0.0001437 kPa) in a 24 hour period. MVT threshold for monolithic resinous climatic flooring shall not exceed 6 lbs/1000 square feet (0.0002155 kPa) over a 24 hour period.
   c. When MVT emission exceeds this limit, apply manufacturer’s recommended vapor control primer or other corrective measures as recommended by manufacturer prior to application of flooring or membrane systems.
   d. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 75-80 percent.
   e. Provide a written report showing test placement and results.
4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
E. Prepare wall to receive integral cove base:
   1. Verify wall material is acceptable for resinous flooring application, if not, install material (e.g. cement board) to receive base.
   2. Fill voids in wall surface to receive base, install undercoats (e.g. water proofing membrane, and/or crack isolation membrane) as recommended by resinous flooring manufacturer.

3. Install base prior to flooring if required by resinous flooring manufacturer.
4. Grind, cut or sand protrusions to receive base application.

3.5 APPLICATION

A. **General**: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.

B. Apply Primer: over prepared substrate at manufacturer's recommended spreading rate.

C. Apply cove base: Trowel to wall surfaces at a 1 inch radius, before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, and troweling, sanding, and top coating of cove base. Round internal and external corners.

D. Trowel mortar base: Mix mortar material according to manufacturer's recommended procedures. Climatic and non-climatic resinous flooring systems may vary slightly on mode of application. Application should be based upon the following: Uniformly spread mortar over substrate using a specially designed screed box adjusted to manufacturer's recommended height. Metal trowel (hand or power) single mortar coat in thickness indicated for flooring system, grout to fill substrate voids. When cured, sand to remove trowel marks and roughness

E. Topcoat: Mix and roller apply the topcoat(s) with strict adherence to manufacturer's installation procedures and coverage rates.

3.6 TOLERANCE

A. From line of plane: Maximum 1/8 inch (3.18 mm) in total distance of flooring and base.

B. From radius of cove: Maximum of 1/8 inch (3.18 mm) plus or 1/16-inch (1.59 mm) minus.

3.7 CURING, PROTECTION AND CLEANING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process.

B. Close area of application for a minimum of 24 hours.

C. Protect resinous flooring materials from damage and wear during construction operation.
   1. Cover flooring with kraft type paper.
   2. Optional 6 mm (1/4 inch) thick hardboard, plywood, or particle board where area is in foot or vehicle traffic pattern, rolling or fixed scaffolding and overhead work occurs.

D. Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

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SECTION 09 91 00
PAINTING

PART 1-GENERAL

1.1 DESCRIPTION

A. Section specifies field painting.

B. Section specifies prime coats which may be applied in shop under other sections.

C. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.

1.2 RELATED WORK

A. Shop prime painting of steel and ferrous metals: Division 05 - METALS, Division 08 - OPENINGS, Division 10 - SPECIALTIES, Division 11 - EQUIPMENT, Division 12 - FURNISHINGS, Division 13 –, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY sections.

B. Contractor option: Prefinished flush doors with transparent finishes: Section 08 14 00, WOOD DOORS.

1.3 SUBMITTALS

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

B. Manufacturer's Literature and Data:
Before work is started, or sample panels are prepared, submit manufacturer's literature, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.

C. Sample Panels:

1. After painters' materials have been approved and before work is started submit sample panels showing each type of finish and color specified.
2. Panels to show color: Composition board, 100 by 250 by 3 mm (4 inch by 10 inch by 1/8 inch).
3. Panel to show transparent finishes: Wood of same species and grain pattern as wood approved for use, 100 by 250 by 3 mm (4 inch by 10 inch

face by 1/4 inch) thick minimum, and where both flat and edge grain will be exposed, 250 mm (10 inches) long by sufficient size, 50 by 50 mm (2 by 2 inch) minimum or actual wood member to show complete finish.

4. Attach labels to panel stating the following:
   a. Federal Specification Number or manufacturers name and product number of paints used.
   b. Specification code number specified in Section 09 06 00, SCHEDULE FOR FINISHES.
   c. Product type and color.
   d. Name of project.
5. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.

D. Sample of identity markers if used.

E. Manufacturers' Certificates indicating compliance with specified requirements:
   1. Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.
   2. High temperature aluminum paint.
   3. Epoxy coating.
   4. Intumescent clear coating or fire retardant paint.
   5. Plastic floor coating.

1.4 DELIVERY AND STORAGE

A. Deliver materials to site in manufacturer's sealed container marked to show following:
   1. Name of manufacturer.
   2. Product type.
   3. Batch number.
   4. Instructions for use.
   5. Safety precautions.

B. In addition to manufacturer's label, provide a label legibly printed as following:
   1. Federal Specification Number, where applicable, and name of material.
   2. Surface upon which material is to be applied.
   3. If paint or other coating, state coat types; prime, body or finish.

C. Maintain space for storage, and handling of painting materials and equipment in a neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.

D. Store materials at site at least 24 hours before using, at a temperature between 18 and 30 degrees C (65 and 85 degrees F).

1.6 APPLICABLE PUBLICATIONS

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

B. American Conference of Governmental Industrial Hygienists (ACGIH):
ACGIH TLV-BKLT-2008.....Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)
ACGIH TLV-DOC-2008.....Documentation of Threshold Limit Values and Biological Exposure Indices, (Seventh Edition)

C. American National Standards Institute (ANSI):
A13.1-07.....Scheme for the Identification of Piping Systems

D. American Society for Testing and Materials (ASTM):
D260-86.....Boiled Linseed Oil

E. Commercial Item Description (CID):
A-A-1555.....Water Paint, Powder (Cementitious, White and Colors) (WPC) (cancelled)

F. Federal Specifications (Fed Spec):
TT-P-1411A.....Paint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls) (CEP)

G. Master Painters Institute (MPI):
No. 1-07.....Aluminum Paint (AP)
No. 4-07.....Interior/ Exterior Latex Block Filler
No. 5-07.....Exterior Alkyd Wood Primer
No. 7-07.....Exterior Oil Wood Primer
No. 8-07.....Exterior Alkyd, Flat MPI Gloss Level 1 (EO)
No. 9-07.....Exterior Alkyd Enamel MPI Gloss Level 6 (EO)
No. 10-07.....Exterior Latex, Flat (AE)
No. 11-07.....Exterior Latex, Semi-Gloss (AE)
No. 18-07.....Organic Zinc Rich Primer
No. 22-07.....Aluminum Paint, High Heat (up to 590% - 1100F) (HR)
No. 26-07.....Cementitious Galvanized Metal Primer
No. 27-07.....Exterior / Interior Alkyd Floor Enamel, Gloss (FE)
No. 31-07.....Polyurethane, Moisture Cured, Clear Gloss (PV)
No. 36-07.....Knot Sealer
No. 43-07.....Interior Satin Latex, MPI Gloss Level 4
No. 44-07.....Interior Low Sheen Latex, MPI Gloss Level 2
No. 45-07.....Interior Primer Sealer
No. 46-07.....Interior Enamel Undercoat

No. 47-07.....Interior Alkyd, Semi-Gloss, MPI Gloss Level 5 (AK)
No. 48-07.....Interior Alkyd, Gloss, MPI Gloss Level 6 (AK)
No. 49-07.....Interior Alkyd, Flat, MPI Gloss Level 1 (AK)
No. 50-07.....Interior Latex Primer Sealer
No. 51-07.....Interior Alkyd, Eggshell, MPI Gloss Level 3
No. 52-07.....Interior Latex, MPI Gloss Level 3 (LE)
No. 53-07.....Interior Latex, Flat, MPI Gloss Level 1 (LE)
No. 54-07.....Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)
No. 59-07.....Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss (FE)
No. 60-07.....Interior/Exterior Latex Porch & Floor Paint, Low Gloss
No. 66-07.....Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved) (FC)
No. 67-07.....Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR)
No. 68-07.....Interior/ Exterior Latex Porch & Floor Paint, Gloss
No. 71-07.....Polyurethane, Moisture Cured, Clear, Flat (PV)
No. 74-07.....Interior Alkyd Varnish, Semi-Gloss
No. 77-07.....Epoxy Cold Cured, Gloss (EC)
No. 79-07.....Marine Alkyd Metal Primer
No. 90-07.....Interior Wood Stain, Semi-Transparent (WS)
No. 91-07.....Wood Filler Paste
No. 94-07.....Exterior Alkyd, Semi-Gloss (EO)
No. 95-07.....Fast Drying Metal Primer
No. 98-07.....High Build Epoxy Coating
No. 101-07.....Epoxy Anti-Corrosive Metal Primer
No. 108-07.....High Build Epoxy Coating, Low Gloss (EC)
No. 114-07.....Interior Latex, Gloss (LE) and (LG)
No. 119-07.....Exterior Latex, High Gloss (acrylic) (AE)
No. 135-07.....Non-Cementitious Galvanized Primer
No. 138-07.....Interior High Performance Latex, MPI Gloss Level 2 (LF)
No. 139-07.....Interior High Performance Latex, MPI Gloss Level 3 (LL)
No. 140-07.....Interior High Performance Latex, MPI Gloss Level 4
No. 141-07.....Interior High Performance Latex (SG) MPI Gloss Level 5

H. Steel Structures Painting Council (SSPC):

SSPC SP 1-04 (R2004)....Solvent Cleaning

SSPC SP 2-04 (R2004)....Hand Tool Cleaning

SSPC SP 3-04 (R2004)....Power Tool Cleaning

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cementitious Paint (CEP): TT-P-1411A [Paint, Copolymer-Resin, Cementitious (CEP)], Type 1 for exterior use, Type II for interior use.

B. Wood Sealer: MPI 31 (gloss) or MPI 71 (flat) thinned with thinner recommended by manufacturer at rate of about one part of thinner to four parts of varnish.

C. Plastic Tape:

1. Pigmented vinyl plastic film in colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES or specified.
2. Pressure sensitive adhesive back.
3. Widths as shown.

D. Identity markers options:

1. Pressure sensitive vinyl markers.
2. Snap-on coil plastic markers.

J. Exterior Alkyd Enamel (EO): MPI 9.

M. Organic Zinc rich Coating (HR): MPI 22.

Q. Knot Sealer: MPI 36.

R. Interior Satin Latex: MPI 43.

S. Interior Low Sheen Latex: MPI 44.

T. Interior Primer Sealer: MPI 45.

U. Interior Enamel Undercoat: MPI 47.

V. Interior Alkyd, Semi-Gloss (AK): MPI 47.

W. Interior Alkyd, Gloss (AK): MPI 49.

x. Interior Latex Primer Sealer: MPI 50.

Z. Interior Latex, MPI Gloss Level 3 (LE): MPI 52.

BB. Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE): MPI 54.

MM. Exterior Alkyd, Semi-Gloss (EO): MPI 94.

NN. Fast Drying Metal Primer: MPI 95.

TT. Waterborne Galvanized Primer: MPI 134.

UU. Non-Cementitious Galvanized Primer: MPI 135.

2.2 PAINT PROPERTIES

A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.

B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.

2.3 REGULATORY REQUIREMENTS/QUALITY ASSURANCE

A. Paint materials shall conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
   1. Volatile Organic Compounds (VOC): VOC content of paint materials shall not exceed 10g/l for interior latex paints/primers and 50g/l for exterior latex paints and primers.
   2. Lead-Base Paint:
      a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
      b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
      c. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
   3. Asbestos: Materials shall not contain asbestos.
   4. Chromate, Cadmium, Mercury, and Silica: Materials shall not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
   5. Human Carcinogens: Materials shall not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.
   6. Use high performance acrylic paints in place of alkyd paints, where possible.
   7. VOC content for solvent-based paints shall not exceed 250g/l and shall not be formulated with more than one percent aromatic hydro carbons by weight.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.
   1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
   2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each days work.

B. Atmospheric and Surface Conditions:
   1. Do not apply coating when air or substrate conditions are:
      a. Less than 3 degrees C (5 degrees F) above dew point.
      b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.
   2. Maintain interior temperatures until paint dries hard.
   3. Do no exterior painting when it is windy and dusty.
   4. Do not paint in direct sunlight or on surfaces that the sun will soon warm.
   5. Apply only on clean, dry and frost free surfaces except as follows:
      a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces where allowed by manufacturer's printed instructions.
      b. Dampened with a fine mist of water on hot dry days concrete and masonry surfaces to which water thinned acrylic and cementitious paints are applied to prevent excessive suction and to cool surface.

3.2 SURFACE PREPARATION

A. Method of surface preparation is optional, provided results of finish painting produce solid even color and texture specified with no overlays.
B. General:
   1. Remove prefinished items not to be painted such as lighting fixtures, escutcheon plates, hardware, trim, and similar items for reinstallation after paint is dried.
   2. Remove items for reinstallation and complete painting of such items and adjacent areas when item or adjacent surface is not accessible or finish is different.
   3. See other sections of specifications for specified surface conditions and prime coat.
   4. Clean surfaces for painting with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry.
C. Wood:
   1. Sand to a smooth even surface and then dust off.
   2. Sand surfaces showing raised grain smooth between each coat.
   3. Wipe surface with a tack rag prior to applying finish.
   4. Surface painted with an opaque finish:
      a. Coat knots, sap and pitch streaks with MPI 36 (Knot Sealer) before applying paint.

b. Apply two coats of MPI 36 (Knot Sealer) over large knots.

5. After application of prime or first coat of stain, fill cracks, nail and screw holes, depressions and similar defects with wood filler paste. Sand the surface to make smooth and finish flush with adjacent surface.
6. Before applying finish coat, reapply wood filler paste if required, and sand surface to remove surface blemishes. Finish flush with adjacent surfaces.
7. Fill open grained wood such as oak, walnut, ash and mahogany with MPI 91 (Wood Filler Paste), colored to match wood color.
   a. Thin filler in accordance with manufacturer's instructions for application.
   b. Remove excess filler, wipe as clean as possible, dry, and sand as specified.

D. Ferrous Metals:
1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning). Exception: where high temperature aluminum paint is used, prepare surface in accordance with paint manufacturer's instructions.
3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.
   a. This includes flat head countersunk screws used for permanent anchors.
   b. Do not fill screws of item intended for removal such as glazing beads.
4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.

E. Zinc-Coated (Galvanized) Metal, Aluminum, Surfaces Specified Painted:
1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).

2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with MPI 18 (Organic Zinc Rich Coating). Prime or spot prime with MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non- Cementitious Galvanized Primer) depending on finish coat compatibility.

F. Masonry, Concrete, Cement Plaster:
1. Clean and remove dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
2. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. Use of solvents, acid, or steam is not permitted.
3. Remove loose mortar in masonry work.
4. Replace mortar and fill open joints, holes, cracks and depressions with new mortar specified in Section 04 05 13, MASONRY MORTARING // Section 04 05 16, MASONRY GROUTING//. Do not fill weep holes. Finish to match adjacent surfaces.
5. Neutralize Concrete floors to be painted by washing with a solution of 1.4 Kg (3 pounds) of zinc sulfate crystals to 3.8 L (1 gallon) of water, allow to dry three days and brush thoroughly free of crystals.
6. Repair broken and spalled concrete edges with concrete patching compound to match adjacent surfaces as specified in CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.

G. Gypsum Plaster and Gypsum Board:
1. Remove efflorescence, loose and chalking plaster or finishing materials.
2. Remove dust, dirt, and other deterrents to paint adhesion.
3. Fill holes, cracks, and other depressions with CID-A-A-1272A [Plaster, Gypsum (Spackling Compound) finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.3 PAINT PREPARATION

A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.
B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.
C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.

D. Mix two component and two part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.

E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.4 APPLICATION

A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.

B. Unless otherwise specified, apply paint in three coats; prime, body, and finish. When two coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.

C. Apply each coat evenly and cover substrate completely.

D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by Resident Engineer.

E. Finish surfaces to show solid even color, free from runs, lumps, brushmarks, laps, holidays, or other defects.

F. Apply by brush, roller or spray, except as otherwise specified.

G. Do not spray paint in existing occupied spaces unless approved by Resident Engineer, except in spaces sealed from existing occupied spaces.

1. Apply painting materials specifically required by manufacturer to be applied by spraying.
2. In areas, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in WORK NOT PAINTED, motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.

I. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

3.5 PRIME PAINTING

A. After surface preparation prime surfaces before application of body and finish coats, except as otherwise specified.

B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.

C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.

D. Prime rebates for stop and face glazing of wood, and for face glazing of steel.

3.9 PAINT COLOR

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.

3.9 ARCHITECTURAL PAINT SYSTEMS

C. Refer to Basis-of-Design paint systems at the end of this section.

3.10 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE

A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.

B. In spaces not scheduled to be finish painted in Section 09 06 00, SCHEDULE FOR FINISHES paint as specified under paragraph H, colors.

C. Paint various systems specified in Division 02 – EXISTING CONDITIONS, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY.

D. Paint after tests have been completed.

E. Omit prime coat from factory prime-coated items.

F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.

G. Omit field painting of items specified in paragraph, Building and Structural WORK NOT PAINTED.

H. Color:
   1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
   2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:

a. White .....Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.
b. Gray: .....Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).
d. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conducts containing fire alarm control wiring, and fire alarm equipment.
e. Federal Safety Orange: .Entire lengths of electrical conduits containing feeders 600 volts or more.
f. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.

I. Apply paint systems on properly prepared and primed surface as follows:
1. Exterior Locations:
a. Apply two coats of MPI 94 (Exterior Alkyd, Semi-gloss (EO)) to the following ferrous metal items:
Vent and exhaust pipes with temperatures under 94 degrees C (200 degrees F), roof drains, fire hydrants, post indicators, yard hydrants, exposed piping and similar items.
b. Apply two coats of MPI 11 (Exterior Latex, Semi Gloss (AE)) to the following metal items:
Galvanized and zinc-copper alloy metal.
c. Apply one coat of MPI 22 (High Heat Resistant Coating (HR)), 650 degrees C (1200 degrees F) to incinerator stacks, boiler stacks, and engine generator exhaust.
2. Interior Locations:
a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) to following items:
1) Metal under 94 degrees C (200 degrees F) of items such as bare piping, fittings, hangers and supports.

2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.
3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.

d. Apply two coats of MPI 22 (High Heat Resistant Coating (HR)) to ferrous metal surface over 94 degrees K (200 degrees F) of following items:
4) Steam line flanges, bare pipe, fittings, valves, hangers and supports over 94 degrees K (200 degrees F).
5) Engine generator exhaust piping and muffler.

e. Paint electrical conduits containing cables rated 600 volts or more using two coats of MPI 94 (Exterior Alkyd, Semi-gloss (EO)) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.

3. Other exposed locations:
a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two coats of MPI 1 (Aluminum Paint (AP)).
b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One coat of MPI 50 (Interior Latex Primer Sealer) and one coat of MPI 10 (Exterior Latex, Flat (AE)).

3.11 BUILDING AND STRUCTURAL WORK FIELD PAINTING

A. Painting and finishing of interior and exterior work except as specified under paragraph 3.11 B.
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.
5. Identity painting and safety painting.

B. Building and Structural Work not Painted:
1. Prefinished items:
a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
2. Finished surfaces:
a. Hardware except ferrous metal.

b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
c. Signs, fixtures, and other similar items integrally finished.

3. Concealed surfaces:
   a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
   b. Inside walls or other spaces behind access doors or panels.
   c. Surfaces concealed behind permanently installed casework and equipment.
4. Moving and operating parts:
   a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
   b. Tracks for overhead or coiling doors, shutters, and grilles.
5. Labels:
   a. Code required label, such as Underwriters Laboratories Inc., Inchcape Testing Services, Inc., or Factory Mutual Research Corporation.
   b. Identification plates, instruction plates, performance rating, and nomenclature.
6. Galvanized metal:
   a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
   b. Gas Storage Racks.
   c. Except where specifically specified to be painted.
7. Metal safety treads and nosings.
8. Gaskets.
9. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundations walls and interior walls in pipe basements.
10. Face brick.
11. Structural steel encased in concrete, masonry, or other enclosure.
12. Structural steel to receive sprayed-on fire proofing.
13. Ceilings, walls, columns in interstitial spaces.
14. Ceilings, walls, and columns in pipe basements.
15. Wood Shingles.

3.12 IDENTITY PAINTING SCHEDULE

A. Identify designated service in accordance with ANSI A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings,

piping in accessible pipe spaces, interstitial spaces, and piping behind access panels.

1. Legend may be identified using 2.1 G options or by stencil applications.
2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12 000 mm (40 feet) apart on straight runs of piping. Identification next to plumbing fixtures is not required.
3. Locate Legends clearly visible from operating position.
4. Use arrow to indicate direction of flow.
5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on drawings where asterisk appears for High, Medium, and Low Pressure designations as follows:
   a. High Pressure - 414 kPa (60 psig) and above.
   b. Medium Pressure - 104 to 413 kPa (15 to 59 psig).
   c. Low Pressure - 103 kPa (14 psig) and below.
   d. Add Fuel oil grade numbers.
6. Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND BBREVIATIONS
Blow-off		Yellow	Black	Blow-off
Boiler Feedwater		Yellow	Black	Blr Feed
A/C Condenser Water Supply		Green	White	A/C Cond Wtr Sup
A/C Condenser Water Return		Green	White	A/C Cond Wtr Ret
Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Shop Compressed Air		Yellow	Black	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower
High Pressure Steam		Yellow	Black	H.P. _____*
High Pressure Condensate Return		Yellow	Black	H.P. Ret ____*
Medium Pressure Steam		Yellow	Black	M. P. Stm ____*
Medium Pressure Condensate Return		Yellow	Black	M.P. Ret _____*
Low Pressure Steam		Yellow	Black	L.P. Stm _____*
Low Pressure Condensate Return		Yellow	Black	L.P. Ret _____*

High Temperature Water Supply		Yellow	Black	H. Temp Wtr Sup
High Temperature Water Return		Yellow	Black	H. Temp Wtr Ret
Hot Water Heating Supply		Yellow	Black	H. W. Htg Sup
Hot Water Heating Return		Yellow	Black	H. W. Htg Ret
Gravity Condensate Return		Yellow	Black	Gravity Cond Ret
Pumped Condensate Return		Yellow	Black	Pumped Cond Ret
Vacuum Condensate Return		Yellow	Black	Vac Cond Ret
Fuel Oil - Grade		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

SPEC WRITER NOTE: If solar hot water system is on project, include the following.

Hot Water Supply Domestic/Solar Water	H.W. Sup Dom/SW
Hot Water Return Domestic/Solar Water	H.W. Ret Dom/SW

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6100 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, // 5000 // 15000 // 25000 //.
8. See Sections for methods of identification, legends, and abbreviations of the following:
   a. Regular compressed air lines: Section 22 15 00, GENERAL SERVICE COMPRESSED-AIR SYSTEMS.
   b. Dental compressed air lines: Section 22 61 13.74, DENTAL COMPRESSED-AIR PIPING / Section 22 61 19.74, DENTAL COMPRESSED-AIR EQUIPMENT.
   c. Laboratory gas and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
   d. Oral evacuation lines: Section 22 62 19.74, DENTAL VACUUM AND EVACUATION EQUIPMENT.
   e. Medical Gases and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
   f. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS / Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS / Section 28 05 33, RACEWAYS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY.

B. Fire and Smoke Partitions:
   1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
   2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.

3. Locate not more than 6100 mm (20 feet) on center on corridor sides of partitions, and with a least one message per room on room side of partition.
4. Use semigloss paint of color that contrasts with color of substrate.

C. Identify columns in pipe basements and interstitial space:
1. Apply stenciled number and letters to correspond with grid numbering and lettering shown.
2. Paint numbers and letters 100 mm (4 inches) high, locate 450 mm (18 inches) below overhead structural slab.
3. Apply on four sides of interior columns and on inside face only of exterior wall columns.
4. Color:
a. Use black on concrete columns.
b. Use white or contrasting color on steel columns.

3.14 PROTECTION CLEAN UP, AND TOUCH-UP

A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.
C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

- - - E N D - - -

APPENDIX

Coordinate the following abbreviations used in Section 09 91 00, PAINTING, with other Sections, and other COATING SECTIONS listed. Use the same abbreviation and terms consistently.

Paint or coating	Abbreviation
Acrylic Emulsion	AE (MPI 10 – flat/MPI 11 – semigloss/MPI 119 - gloss)
Alkyd Flat	Ak (MPI 49)
Alkyd Gloss Enamel	G (MPI 48)
Alkyd Semigloss Enamel	SG (MPI 47)
Aluminum Paint	AP (MPI 1)
Cementitious Paint	CEP (TT-P-1411)
Exterior Latex	EL??(MPI 10 / 11 / 119)??
Exterior Oil	EO (MPI 9 – gloss/MPI 8 – flat/MPI 94 – semigloss)
Epoxy Coating	EC (MPI 77 – walls, floors/MPI 108 – CMU, concrete)
Fire Retardant Paint	FR (MPI 67)
Fire Retardant Coating (Clear)	FC (MPI 66, intumescent type)

Floor Enamel FE (MPI 27 – gloss/MPI 59 – eggshell)

Heat Resistant Paint HR (MPI 22)

Latex Emulsion LE (MPI 53, flat/MPI 52, eggshell/MPI 54, semigloss/MPI 114, gloss Level 6

Latex Flat LF (MPI 138)

Latex Gloss LG (MPI 114)

Latex Semigloss SG (MPI 141)

Latex Low Luster LL (MPI 139)

Plastic Floor Coating PL

Polyurethane Varnish PV (MPI 31 – gloss/MPI 71 - flat)

Rubber Paint RF (CID-A-A-3120 - Paint for Swimming Pools (RF)).

Water Paint, Cement WPC (CID-A-A-1555 - Water Paint, Powder).

Wood Stain WS (MPI 90)

Verify abbreviations used in the following coating sections:

Section 09 96 59, HIGH-BUILD GLAZED COATINGS GC

Section 09 94 19, MULTICOLOR INTERIOR FINISHING MC

BASIS-OF-DESIGN ARCHITECTURAL PAINT SYSTEMS

1. **EXTERIOR**

a. **Steel-galvanized, gloss finish: 2 finish coats over a primer**
Primer Coat- 90-712 PPG PITT-TECH® Int/Ext Primer/Finish DTM Industrial Enamel
Finish Coats- 6-1410 PPG SPEEDHIDE® Interior/Exterior WB Alkyd Satin

2. **INTERIOR**

a. **Steel-factory primed and non-primed, semi-gloss: 2 finish coats over a primer**
1.) Hollow metal door frames
Primer Coat- 90-712 PPG PITT-TECH® Int/Ext Primer/Finish DTM Industrial Enamel
Finish Coats- 6-1410 PPG SPEEDHIDE® Interior/Exterior WB Alkyd Satin

2.) Miscellaneous exposed steel framing
Primer Coat- 90-712 PPG PITT-TECH® Int/Ext Primer/Finish DTM Industrial Enamel
Finish Coats- 6-1410 PPG SPEEDHIDE® Interior/Exterior WB Alkyd Satin

b. **Concrete, stain & sealer: 2 coats**
Existing floors
1.) Finish Coat- 4-1210 PPG PERMA-CRETE® Color Seal™ WB Interior/Exterior Acrylic
Concrete Stain

Concrete, traffic surfaces existing and new concrete floors:, gloss: 2 coats
1.) 2 coats V76-610 PPG BREAK-THROUGH! 50 I/E Gloss Water-Borne Acrylic

c. Gypsum Board, eggshell finish 2 coats over a primer

1.) Walls and Soffits

Primer Coat- 6-4900 PPG SPEEDHIDE® zero Interior Zero VOC Latex Sealer

Finish Coats- 6-4310 PPG SPEEDHIDE® zero Interior Zero VOC** Latex Eggshell

d. Gypsum Board-moisture resistant in high humidity areas (glass wash room) semi-gloss: 2 coats over an alkali resistant primer

1.) Walls-glass wash room

Primer Coat- 4-603 PPG PERMA-CRETE® Interior/Exterior Alkali Resistant Primer

Finish Coats- 16-510 PPG PITT-GLAZE WB1 Interior Semi-Gloss Pre-Catalyzed Water Borne Acrylic Epoxy

2.) Portland Cement Plaster Ceilings

Primer Coat-4-603 PPG PERMA-CRETE® Interior/Exterior Alkali Resistant Primer

Finish Coats-16-510 PPG PITT-GLAZE WB1 Interior Semi-Gloss Pre-Catalyzed Water-Borne Acrylic Epoxy

e. Wood, satin finish; 2 coats over a primer:

1.) MDF panels painted and attached to the walls;

Primer Coat- 17-921 PPG SEAL GRIP® I/E WB Acrylic Universal Primer

Finish Coats- 6-1410 PPG SPEEDHIDE® Interior/Exterior WB Alkyd Satin

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SECTION 10 11 13
CHALKBOARDS AND MARKERBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies markerboards and related items.

B. Where shown, assemble markerboards with tackboards into a single unit.

1.2 RELATED WORK

Color of frame aluminum anodic coating and markerboard writing surface: CLEAR ANODIZED

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. ~~M~~arkerboard writing surface, 300 by 300 mm (six by six inches), each color, mounted on backing unless noted otherwise.
3. Each accessory (after approval, may be used in the work).

1.5 APPLICABLE PUBLICATIONS

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

B. American National Standards (ANSI):

Z97.1-09.....Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

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

B221/B221M-08.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

C1036-06.....Flat Glass

C1048-04.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass

F104-03(R2009).....Nonmetallic Gasket Materials

D. Composite Panel Association (CPA):

A208.1-09.....Particleboard

A135.4-04.....Basic Hardboard

E. Porcelain Enamel Institute (PEI)

1001-11.....Architectural Porcelain Enamel

PART 2 - PRODUCTS

2.1 MARKERBOARD

Markerboards shall consist of a writing surface, snap on aluminum frame, chalk trough, mullions, 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.

5. Mullions: Snap-on type, same material and face width as frames, designed to finish flush with frame.
6. Grounds: Continuous zinc-coated (galvanized) steel or extruded aluminum members designed to support the board writing surface and clips for snap-on frames, map rail and chalk tray.
7. Clips: Manufacturer's standard as required to support frame, mullions, display rail, and trough.

C. Boards 3660 mm (12 feet) or less in length shall be in one piece. Larger units shall have one joint at center. Joints shall have metal spline, with faces in same plane and edges shall touch along entire length.

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).

2. AA 45 chemically etched medium matte, with integrally colored anodic coating, Class II Architectural, 0.4 mils thick (AA-M12C22A32, of color to match approved sample).

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 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 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies wall guards (crash rails), high impact wall covering and corner guards.

1.2 RELATED WORK

A. Concealed blocking: 09 22 16: Non-structural Metal Framing

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

1.3 SUBMITTALS

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

B. Shop Drawings: Show design and installation details.

C. Manufacturer's Literature, Data and color samples:

1. Corner Guards.
2. Crash Rail.
3. High Impact Wall covering

D. Test Report: Showing that resilient material complies with specified fire and safety code requirements.

1.4 DELIVERY AND STORAGE

A. Deliver materials to the site in original sealed packages or containers marked with the name and brand, or trademark of the manufacturer.

B. Protect from damage from handling and construction operations before, during and after installation.

C. Store in a dry environment of approximately 21° C (70 degrees F) for at least 48 hours prior to installation.

1.5 APPLICABLE PUBLICATIONS

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

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

A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

D256-06.....Impact Resistance of Plastics

D635-06.....Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position

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

C. The National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual

D. National Fire Protection Association (NFPA):
80-10.....Standard for Fire Doors and Windows

E. Society of American Automotive Engineers (SAE):
J 1545-05.....Instrumental Color Difference Measurement for Exterior Finishes.

F. Underwriters Laboratories Inc. (UL):
Annual Issue.....Building Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A167, Type 302B.

B. Aluminum Extruded: ASTM B221, Alloy 6063, Temper T5 or T6. Aluminum alloy used for colored anodizing coating shall be as required to produce specified color.

C. Resilient Material:

1. Extruded and injection molded acrylic vinyl or extruded polyvinyl chloride meeting following requirements:
   a. Minimum impact resistance of 1197 ps (25 ft lbs per sq.ft) when tested in accordance with ASTM D256 (Izod impact, ft.lbs. per inch notch).
   b. Class 1 fire rating when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less.
   c. Rated self extinguishing when tested in accordance with ASTM D635.
   d. Material shall be labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.
   e. Integral color with all colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.
   f. Same finish on exposed surfaces.

2.2 CORNER GUARDS

A. Resilient, Shock-Absorbing Corner Guards: Surface mounted radius corner formed to profile shown.

1. Snap-on corner guard formed from resilient material, minimum 2 mm (0.078-inch) thick, free floating on a continuous 1.6 mm (0.063-inch) thick extruded aluminum retainer. Design retainer used for flush mounted type to act as a stop for adjacent wall finish material.

Provide appropriate mounting hardware, cushions and base plates as required.

2. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.

2.3 WALL GUARDS

A. Resilient Wall Guards:

1. Wall Guards (Crash Rails): Snap-on covers of resilient material, minimum 2.8 mm (0.110-inch) thick, shall be free-floated over 50 mm (two-inch) wide aluminum retainer clips, minimum 2.3 mm (0.090-inch) thick, anchored to wall at maximum 600 mm (24 inches) on center, supporting a continuous aluminum retainer, minimum 1.6 mm (0.062-inch) thick; or, shall be free-floated over a continuous extruded aluminum retainer, minimum 2.3 (0.090-inch) thick anchored to wall at maximum 600 mm (24 inches) on center.

2. Provide wall guards (crash rails) with prefabricated and closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories as required. End caps and corners shall be field adjustable to assure close alignment with handrails and wall guards (crash rails). Screw or bolt closure caps to aluminum retainer.

2.4 HIGH IMPACT WALL COVERING

A. Fabricate from vinyl acrylic or polyvinyl chloride resilient material minimum 6mm (0.06 inch) thick designed specially for interior use.

B. Protect wall covering during installation of wall guards (crash rails).

C. Provide adhesive as recommended by the wall covering manufacturer.

2.6 FASTENERS AND ANCHORS

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

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

2.7 FINISH

A. In accordance with NAAMM AMP 500 series.

B. Aluminum:

1. Exposed aluminum: AAC22A31 chemically etched medium matte, with clear anodic coating, Class II Architectural, 0.4 mil thick.

2. Concealed aluminum: Mill finish as fabricated, uniform in color and free from surface blemishes.

C. Stainless Steel: NAAMM finish Number 4.

D. Resilient Material: Embossed texture and color in accordance with approved samples.

PART 3 - INSTALLATION

3.1 RESILIENT CORNER GUARDS

A. Install corner guards on walls in accordance with manufacturer's instructions.
   1. Mount guards on external corners of interior walls, partitions and columns as shown.
   2. Where corner guards are installed on gypsum board, clean surface and anchor guards with a neoprene solvent-type contact adhesive specifically manufactured for use on gypsum board construction. Remove excess adhesive from around edge of guard and allow to cure undisturbed for 24 hours.

3.2 RESILIENT WALL GUARDS (CRASH RAIL)

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

3.3 HIGH IMPACT WALL COVERING

A. Surfaces to receive protection shall be clean, smooth and free of obstructions.
B. Install Hi-Impact wall preceding installation of wall guards in accordance with approved shop drawings and manufacturers specific instructions.
C. Apply with adhesive in controlled environment according to manufacture’s recommendations.

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SECTION 10 44 13
FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers recessed fire extinguisher and Automatic External Defibrillator 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

B. Basis-For-Design Guide: J. L. Industries; Cosmopolitan Series, (Recessed), (Ground, First and Second Floors) or equivalent.

1. Door and Trim Construction:
   a. No. 6 Satin Stainless Steel, Series 8135.
   b. Continuous hinge.
   c. Zinc-plated handle and roller catch.
2. Trim Style and Depth: Recessed, 3/8 inch flat trim.
3. Tub: Cold-rolled steel with white powder coat finish.
4. Glazing: Clear acrylic.

C. Fabricate door and trim from same material as body of cabinet 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.

2.2 AUTOMATED EXTERNAL DEFIBRILLATORS

A. Basis-Of-Design Product: J. L. Industries; AED Cabinet 1400 Series or equivalent.

1. Construction: Recessed, ADA compliant, 3-inch stainless steel Series 1437, rolled

B. Finish: No. 6 satin stainless steel.

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 109903
MISCELLANEOUS SPECIALTIES – GAS CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The specifications section "General Conditions" and "Special Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

A. Section Includes:
   1. Gas Cylinder Cabinet

B. Related Sections:
   1. Section 09250 - Gypsum Drywall: Metal blocking for equipment.

1.3 REFERENCES

A. NFPA 30 - Flammable and Combustible Liquids Code.

B. Compressed Gas Association, Inc. (CGA) - Handbook of Compressed Gases and Standards, S-1.1, S-1.2 and S-1.3.

C. NFPA 45 - Standards for Laboratories Using Chemicals.

D. NFPA 58 - Liquified Petroleum Gases Code.

E. Department of Transportation (DOT) Requirements (49 CFR Part 178).

F. Occupational Safety and Health Administration (OSHA) 1926.152 and .153.

1.4 SUBMITTALS

A. Product Data, Shop Drawings, Samples:
   1. Manufacturer's standard catalog cuts indicating compliance with the performance and design requirements.
   2. Shop drawing or other data showing support requirements.

1.5 QUALITY ASSURANCE

A. Qualifications: standard product of a manufacturer of the specialty item required.

B. Regulatory Requirements:
   1. Comply with all requirements of DOT, State Regulatory Agency, and OSHA.

1.6 DELIVERY, STORAGE AND HANDLING

A. Acceptance at Site: in manufacturer's unopened packaging.

1.7 SEQUENCE AND SCHEDULING

A. Deliver to site when required by the Progress Schedule.

B. Coordinate installation with Laboratory Casework Contractor.

PART 2 - PRODUCTS

2.1 GAS CYLINDER CABINET

A. Manufacturers:
   1. Subject to compliance with requirements, provide Semi-Gas gas cylinder cabinets as manufactured by Applied Energy Systems, Inc. 180 Quaker Lane, Malvern, PA. 19355; Phone 1-610-647-8744.

B. Materials:
   1. Model: Semi-Gas Centurion Manual, or equal
   2. Meets or exceeds Article 80 UFC requirements.
   3. Cabinet shall accommodate 2 flammable gas cylinders.
   4. Provide manifold for two process gases.
   5. Welded 11 Ga. Steel enclosure
   6. Window: ¼” wire reinforced safety glass.
   7. Paint: Powder coat - light grey.
   8. Cabinet Floor: Painted steel with protective rubber mat
   9. Door: automatic closing and latching door, with lock
   10. Integral Sprinkler: Fuse rating of 155 degrees F
   11. Water pipe connection: ½” NPT Female.
   12. Inlet air louver in door
   13. Exhaust connection: 6” diameter, 350 CFM window open
   14. Cylinder restraints with strap and chain
   15. H2 sensors: Honeywell Midas H2 Gas Detectors were indicated and in Chroma room GA215
      a. One within the cabinet
      b. One field installed outside the cabinet connected to the sensor within the cabinet

C. Option Remote Control Box: Coordinate with users.

D. Valve Manifold Boxes: Coordinate with users.

E. Schedule:

1. GC25-A: 2 Cylinder Cabinet, 2 Process Gasses with Monitors and Manual Change-over, Analog Cyl. Scale.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces scheduled to receive the holders, racks or equipment for:
   1. Defects that will adversely affect the execution and quality of the installation.
   2. Deviation beyond allowable tolerances for installation of the miscellaneous specialties.

B. Do not start work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Install backer plates prior to installing holders, racks or equipment.

3.3 INSTALLATION
   1. Installer to provide required structural support in accordance with manufacturer's published instructions.
   2. Use concealed fasteners where possible.

END OF SECTION 109901

SECTION 11 53 13
LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 DESCRIPTION

This section includes chemical (general purpose) hoods, radioisotope hoods, in designs and configurations specified hereunder.

1.2 DEFINITIONS

A. CHEMICAL OR GENERAL-PURPOSE HOODS

1. BYPASS HOOD: A hood that contains openings above the sash and below the airfoil, which redistribute the air to reduce fluctuations in face velocity and turbulence within the hood, when the sash is re-positioned.

B. Radioisotope Hood: A hood that is used for radioactive applications, with a stainless steel liner and an integral work surface.

1.3 RELATED WORK

A. Section 22 15 00, GENERAL SERVICE COMPRESSED-AIR SYSTEMS: Connections to Compressed Air System.

B. Section 22 11 00, FACILITY WATER DISTRIBUTION: Plumbing Connections.

C. Section 22 13 00, FACILITY SANITARY SEWERAGE: Plumbing Connections.

D. Section 22 66 00, CHEMICAL-WASTE SYSTEMS FOR LABORATORY FACILITIES: Plumbing Connections.

E. Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY FACILITIES: Connections to Gas and Vacuum Systems.

F. Section 22 63 00, GAS SYSTEMS FOR LABORATORY FACILITIES: Connections to Gas and Vacuum Systems.

G. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

H. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION: Integral Blowers on Hoods.

I. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Face Velocity Sensor Controller.

J. Section 23 34 00, HVAC FANS.

K. Section 23 36 00, AIR TERMINAL UNITS: Airflow Control Valves.

L. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Electrical Connections.

M. Section 26 27 26, WIRING DEVICES: Electrical Devices.

N. Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS: Motor Starters.

1.4 PERFORMANCE REQUIREMENTS

A. Average Face Velocity for general chemical fume hoods: 0.51 m/s (100 fpm) with sash located at the average sash stop of 18 inches.

B. Containment: Furnish and install laboratory fume hoods that are tested according to ASHRAE 110 at a release rate of 4.0 L/min. (0.1 CFM) (VA Comment: Provide equivalent inch/pound unit.)

1. Face Velocity Variation: Allowable VA variation threshold is not more than +-10% of average face velocity.
2. Sash Position:
   a. For Vertical Sash units, test with sash fully open, and at typical sash stop height of 18”.
3. As-Manufactured (AM) Rating: AM 0.05 (0.05 ppm).
4. As-Installed (AI) Rating: AI 0.05 (0.05 ppm).

C. Average Static-Pressure Loss: Not more than 93 Pa (3/8-inch wg) at 0.51-m/s (100-fpm) face velocity when tested according to SEFA 1.2.

1.5 QUALITY CONTROL

A. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable, maintainable, and accessible.

B. Standard Products: Material and equipment shall be the standard products of the selected manufacturer, and they should be regularly engaged in the manufacture of such products for at least 3 years.

C. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.

D. 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. 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.

E. Electrical Components and Devices: UL listed and labeled for intended use.

1.6 SUBMITTALS

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

B. Manufacturer's Literature and Data: Include the following:

1. Illustrations and descriptions of laboratory fume hoods and factory-installed devices for fume hoods.
2. Catalog or model numbers for each item incorporated into the work.
3. Static-pressure losses and exhaust volumes for fume hoods.
4. Results of testing according to ASHRAE 110.

C. Shop Drawings: Show details of fabrication, installation, adjoining construction, coordination with mechanical and electrical work, anchorage, and other work required for complete installation.

D. Field Test Reports: Indicate dates and times of tests and certify test results.

E. Factory Test Reports: Provide manufacturer’s QC checklist or other reports that indicate comprehensive factory testing has been performed, and the results of these tests have been certified.

F. Operating Instructions: Comply with requirements in Section 01 00 00, GENERAL REQUIREMENTS.

G. LEED Information:

1. LEED (v 3.0) MR Credit 4, Recycled Content: Product data indicating percentages, by weight of post-consumer and post-industrial recycled content for products having recycled content:
   a. Include statement indicating costs for each product having recycled content.
2. LEED (V 3.0) MR Credit 5, Regional Materials: Manufacturer’s data identifying point of origin for products procured within 500 mile radius of the project:
   a. Include statement indicating costs for each product submitted.

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 National Standards Institute / American Society of Heating, Refrigerating and Air-Conditioning Engineers (ANSI/ASHRAE):

110-1995.....Method of Testing Performance of Laboratory Fume Hoods

C. Scientific Equipment and Furniture Association (SEFA):
   1-2005.....Recommended Practices for Laboratory Fume Hoods
   2-1999.....Recommended Practices for Installation
D. National Fire Protection Association (NFPA):
   45-2011.....Standard on Fire Protection for Laboratories using Chemicals

PART 2 – PRODUCTS

2.1 FUME HOODS, GENERAL

A. Furnish and install laboratory fume hoods that comply with recommendations in SEFA 1
B. Confirm factory-installed service fixtures and electrical devices in locations shown on drawings.
C. Ductwork: All ductwork shall be stainless steel. Refer to Section 23 31 00 HVAC DUCTS and CASINGS.
D. Face Velocity Controller (Constant Volume Fume hoods): Provide fume hood exhaust control damper in the hood discharge to maintain the velocity through the open face of the hood regardless of sash position. Refer to Section 23 09 23 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
E. Gas, Air, and Vacuum Service Fixtures: Remote controlled; with valve identified by index button; with serrated tip outlets; color-code valves and outlets. Refer to Section 22 62 00 VACUUM SYSTEMS FOR LABORATORY and Section 22 63 00 GAS SYSTEMS FOR LABORATORY.
   1. Service Fixture Type: Provide fixtures that are panel-mounted remote control front loading, mounted at a 90 degree angle to the fascia post of the fume hood. The handles of the fixture are thus oriented toward the user's field of view and area of maximum dexterity. The valve body is easily removed for repair without entering the hood chamber.
   2. Provide fixtures with chrome plated brass four cross handles.
      a. Air, Nitrogen & Vacuum – Chicago Faucets model 1322-AGV, WaterSaver model L4200-158WSA or equal with stainless steel shank
         1) Pre-piped up with 3/8″ schedule 40, seamless type 304 stainless steel with threaded fittings.
      b. Natural Gas – Chicago Faucets model 1322-AGV, WaterSaver model L4260-158CVWSA or equal.
         1) Pre-piped up with 3/8″ ASTM A53 Grade A and B, schedule 40, black Iron with threaded fittings. Copper tube and pipe shall not be used for natural gas.

Water Service Fixtures: Remote controlled, with integral vacuum breaker and as follows:
   1. Turret 152.4 mm (6 inch) swing gooseneck outlet.

2. Chrome plated brass.
3. Refer to Section 22 11 00 FACILITY WATER DISTRIBUTION.
4. Cold Water Outlet – Chicago Faucets model 1323-CP, WaterSaver model L739(R or L)W-KR-385A or equal
   a) Pre-piped up with 3/8" class 100 CU copper ASTM 1388-72 ANSI B88
5. Cold Water Gooseneck Faucet – Chicago Faucets model 980-GN2BVBE7CP, WaterSaver model L739(R or L)W-9-385A or equal
   a) Pre-piped up with 3/8" class 100 CU copper ASTM 1388-72 ANSI B88 Type I

G. Service-Fixture Color-Coding: Color-code service fixtures as follows:

Service	**Color**
Water	Dark Green
Air	Orange
Gas	Dark Blue
Vacuum	Yellow
Nitrogen	Brown

H. Lighting Fixtures:
   1. Vapor proof Fixtures: 120-V 2-tube fluorescent.

I. Receptacles and Switches: Include junction box and cover plate. Refer to Section 26 27 26 WIRING DEVICES.
   1. Duplex Receptacles: 120 V, single phase, 20 A, 2 pole, 3 wire.
   2. Ground Fault Interrupter (GFI) Duplex Receptacles: Integral unit with 2-pole, 3-wire, 120-V, 20-A receptacle.
   3. Switches with Receptacles: Single-pole switch to control lighting fixtures and 120-V, 15-A, 2-pole, 3-wire single receptacle.

J. Airflow Monitor: Provide opening coordinated DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC. Monitor provided by HVAC SYSTEM with audible alarm and warning light. System includes digital type unit with alarm contacts to allow connection to the DDC control system to facilitate remote monitoring. Refer to Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

2.2 BYPASS FUME HOODS

A. Airflow Systems: Bypass, Constant volume.
B. Liners: Polyester resin
C. Work Surfaces: Epoxy resin.
D. Sinks: Epoxy resin.

1. Cup Sinks: Equip with DN 40 (NPS 1-1/2) tailpiece, sink stopper, and P trap.
2. Laboratory Sinks: Equip with DN 40 (NPS 1-1/2) sink outlet, sink stopper, beehive overflow, and P trap.

E. Lighting Fixtures: Vapor proof.

F. Blowers: Remote; sized to create exhaust air volume that produces average face velocity indicated with sashes fully open. Blowers shall be constructed with chemical chemical-resistant coating. Refer to Section 23 34 00 HVAC FANS.

G. Sashes: Vertical type; fully tempered safety glass.
   1. Accessories: Sash stops, commonly installed 18”.

H. Bases: Cabinet, Acid, Corrosive or Flammable.

2.3 RADIOISOTOPE FUME HOODS

A. Airflow Systems: Bypass

B. Liners and Work Surfaces: Stainless steel, Type 304, No. 4 finish; seamless construction; and with integral dished work surface.

C. Lighting Fixtures: Vapor proof.

D. Filters: Carbon Type; with bag in and bag out housings.

E. Blowers: Remote; sized to create exhaust air volume that produces average face velocity indicated with sashes at the sash stop(18” open). Blowers shall be constructed with chemical chemical-resistant coating. Refer to Section 23 34 00 HVAC FANS.

F. Sashes: Vertical Type; fully tempered safety glass.
   1. Accessories: Sash stops, commonly installed at 18”.

G. Bases: Cabinet, Acid, Corrosive or Flammable.

2.4 **UNDERSTRUCTURE CABINETRY**

A. Base Cabinets: Comply with Division 12 Section "Laboratory Casework. "Provide metal base cabinets in finish matching fume hood exterior finish.] Base cabinet exterior construction is 18 gauge (or heavier) cold rolled sheet steel. All exterior painted surfaces are baked on, dry powder epoxy applied electrostatically. Base metal material is properly prepared for epoxy coating.

B. Fume Hood Base Stands: Fabricated from not less than 2-inch-square electrically welded steel tubing. Provide leg stretchers where necessary to comply with structural

performance requirements. Weld leg stretchers, cross stretchers, and work top support rails to legs, and finish entire assembly with chemical-resistant finish. Provide leveling device at each corner of base stand at floor.

C. Provide clear floor space not less than **36 inches** wide by 25 inches (635 mm) deep by 27 inches (685 mm) high within fume hood base stands unless otherwise indicated.

D. Flammable Solvent Storage Fume Hood Base Cabinets:

E. Solvent storage cabinets are specifically designed for the storage of flammable and combustible liquids.

F. Construction is based upon the requirements listed by NFPA No. 30 – 1993.

G. Cabinets 30" wide and greater will be Factory Mutual approved.

H. The bottoms, top, sides and doors are fabricated of 18 gauge steel and are all double panel construction with a 1-1/2" air space between panels.

I. All joints are welded or screwed to provide a rigid enclosure.

J. A 2" deep liquid tight pan that covers the entire bottom of the cabinet is furnished to contain liquid leaks and spills.

K. A full-depth adjustable shelf is also provided.

L. Two diametrically opposed flame arrestor vents with spark screens are provided in the back of the cabinet, as well as a grounding screw.

M. The cabinet has an interior finish same as the exterior.

N. The cabinet is labeled: "FLAMMABLE - KEEP FIRE AWAY".

O. Door handles include a key lock. On self-closing/self-latching models, a fusible-link feature ensures the doors will close if the temperature outside the cabinet exceeds 165 degrees Fahrenheit. The doors are synchronized so that both doors will fully close.

P. Cabinet: Acid storage base cabinet interior liner is corrosion-resistant polyethylene panels. Nominal thickness is 3/16

1. Bottom pan and optional shelf liner tray is vacuum formed, 0.090 Georgia Gulf PVC.
2. Provide acid fume vent kit meets ASTM standard F1412-92 for corrosion-resistant polyolefin piping with 2" diameter connection locknut. Vent into hood.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install laboratory fume hoods to comply with SEFA 2.

B. Locate unit away from fans, heating and air conditioning registers, laboratory hoods, high traffic areas and doors that could interfere with airflow patterns.

3.2 TESTS

A. Field test installed laboratory fume hoods according to ASHRAE 110 to verify compliance with performance requirements for containment.

1. For units that fail testing, make adjustments and corrections to installation, or replace fume hoods, and repeat tests until fume hoods comply with requirements.

3.3 PROTECTING AND CLEANING

A. Protect equipment from dirt, water, and chemical or mechanical injury during the remainder of the construction period.

B. At the completion of work, clean equipment as required to produce ready-for-use condition.

3.4 INSTRUCTIONS

Instruct personnel and transmit operating instructions in accordance with requirements in Section 01 00 00, GENERAL REQUIREMENTS. Training must be provided by Manufacturer or Installer.

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SECTION 11 53 53
BIOLOGICAL SAFETY CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies Biological Safety Cabinets: Class II, Type B2, Hard Connected. Non-Connected units are by the owner.

1.2 DEFINITIONS

A. Class II Biological Safety Cabinet: A ventilated cabinet for exposure protection of personnel, product and the environment, suitable for work involving low to moderate risk agents (BSL 1,2, and 3). Cabinet air is exhausted through a HEPA filter to the outside. Class II cabinets are available as two types (A and B) based on construction, air flow velocities and patterns, and exhaust systems. Refer to Table 1.

1.3 RELATED WORK

A. Section 22 15 00, GENERAL SERVICE COMPRESSED-AIR SYSTEMS: Connections to Compressed Air System.

B. Section 22 11 00, FACILITY WATER DISTRIBUTION: Plumbing Connections.

C. Section 22 13 00, FACILITY SANITARY SEWERAGE: Plumbing Connections.

D. Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES: Connections to Gas and Vacuum Systems.

E. Section 22 63 00, GAS SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES: Connections to Gas and Vacuum Systems.

F. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Pressure Switches.

G. Section 23 31 00, HVAC DUCTS and CASINGS: Ductwork.

H. Section 23 36 00, AIR TERMINAL UNITS: Airflow Control Valves.

I. Section 23 40 00, HVAC AIR CLEANING DEVICES: HEPA Filters.

J. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS and CABLES (600 VOLTS AND BELOW): Electrical Connections.

K. Section 26 27 26, WIRING DEVICES: Electrical Devices.

1.4 QUALITY CONTROL

A. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable, maintainable, and accessible.

B. Standard Products: Material and equipment shall be the standard products of the selected manufacturer, and they should be regularly engaged in the manufacture of such products for at least 3 years.

C. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.

D. NSF Compliance: Equipment bears NSF (National Sanitation Foundation) Certification Mark indicating compliance with NSF 49. This certification applies only to Class 1 and 2 Biological Safety Cabinets, not LAFW.

E. Electrical Components and Devices: UL listed and labeled for intended use.

1.5 SUBMITTALS

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

B. Manufacturer's Literature and Data: Include the following:

1. Illustrations and descriptions of the unit and factory-installed devices associated with it.
2. Catalog or model numbers for each item incorporated into the work.
3. Utility requirements.

C. Shop Drawings: Show details of fabrication, installation, adjoining construction, coordination with mechanical and electrical work, anchorage, and other work required for complete installation.

D. Factory Testing: Provide manufacturer’s QC checklist or other reports that indicate comprehensive factory testing has been performed, and the results of these tests.

E. Field Test Reports: Provide certification reports from accredited service technicians or installers.

F. Operating Instructions: Comply with requirements in specification Section 01 00 00, GENERAL REQUIREMENTS.

1.6 APPLICABLE PUBLICATIONS

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

B. American National Standards Institute / National Electrical Manufacturers Association (ANSI/NEMA):

WD 6-2002 (R2008).....Wiring Devices--Dimensional Specifications

C. National Sanitation Foundation International / American National Standards Institute (NSF/ANSI):
49-2009.....Biosafety Cabinetry: Design, Construction, Performance and Field Certification

D. Scientific Equipment and Furniture Association (SEFA):
2-1999.....Recommended Practices for Installation
7-2007.....Recommended Practices for Fixtures

E. National Fire Protection Association (NFPA):
45-2011.....Standard on Fire Protection for Laboratories using Chemicals

PART 2 - PRODUCTS

2.1 BIOLOGICAL SAFETY CABINETS (BSC - CLASS II – B2)

A. General Specification for Biological Safety Cabinets
Furnish and install biological safety cabinets that have the following characteristics:

1. Cabinet Exterior:
   a. Class II: Reinforced cold-rolled steel with acid-resistant painted finish.
2. Cabinet Interior:
   a. Class II: stainless steel.
3. View Screen: Slanted, Sloped at 10 degrees, Sliding, 6-mm- (1/4-inch-) minimum thick, laminated safety glass.
4. Motor/Blower System: To circulate filtered air into and/or through cabinet.
5. Exhaust Transition for Hard Connection to Exhaust Duct: Stainless-steel duct to direct air from the recirculation blower cabinet to the exterior. Refer to Section 23 31 00, HVAC DUCTS and CASINGS.
6. HEPA Filtering: 99.99 percent effective on 0.3 microns for both recirculated and exhausted air. Refer to Section 23 40 00, HVAC AIR CLEANING DEVICES.
7. Lighting: Fluorescent lights producing a minimum of 1076 lux (100 fc) of non-glare illumination in the work area, and ultraviolet lamp electrically interlocked to be inoperable while fluorescent lighting is "on."

8. Magnehelic Gauge: Located on the front of the cabinet to indicate cabinet interior pressure. Provide DDC sensor with remote indicator. Refer to Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
9. Equip with listed hospital-grade duplex receptacles having drip proof covers, and control switch. Refer to Section 26 27 26, WIRING DEVICES for additional requirements
10. Equip with gas, vacuum, water, and air valves, as needed.
11. Equip with the following controls:
    a. Direct-Digital Control Monitor installation. Monitor provided by HVAC. Refer to Section 23 09 23 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC
    b. On/off switch for fluorescent and ultraviolet lamps.
    c. Circuit breaker and on/off switch for duplex outlets.
    d. Removable stainless steel exhaust duct transition unit with airtight damper on type A2 cabinet.
12. Locate HEPA filters and blower so that they are removable from the front without entry into workspace.
13. Equip with drain spillage trough in each unit. Provide ball valve and cap on trough drain outlet.
14. Equip with a supportive work surface or base stand.

SPEC WRITER NOTE: Edit the following requirements to coordinate with the equipment shown on drawings.

B. Class II Biological Safety Cabinet Types: Furnish and install Class II biological safety cabinets, according to the following table:

Table 1

TYPE	AIRFLOW	MAXIMUM FACE VELOCITY	Biosafety Level	COMMENTS
B2	100 percent direct exhaust	0.51 m/s (100 fpm)	1,2,3	All ducts and plenums must be under negative pressure.

2.2 MECHANICAL SERVICE FIXTURES

A. Valves, General Requirements:
    1. Comply with requirements in SEFA 7.

2. Cast red brass alloy bodies with copper content not less than 81 percent, or drop forged brass alloy with high density and no porosity.
3. Locate valves so that they are accessible for maintenance and repair of internal working parts.
4. Equip valves with four-arm handles.
5. Design valves to withstand 689 kPa (100 psig) without leakage.

B. Gas, Air, and Vacuum Valves:
1. Provide floating needle valves with a replaceable cone and a replaceable valve seat.
2. Provide bonnet with exterior packing nut and packing gland designed for valve to be repacked while under pressure.

C. Outlet Fittings: Fit each outlet with a 10 serrated hose connector.

D. Electrical System: 115 V, 1 phase, 60 Hz.

E. Identification: Code valves with full-view plastic index buttons as follows:

Table 3

SERVICE	BUTTON COLOR	CODE	LETTER COLORS
Air	Orange	AIR	Black
Gas	Dark Blue	GAS	White
Vacuum	Yellow	VAC	Black

F. Finish:
1. Fixtures, Handles, and Escutcheons: Polished chrome plate.
2. Fixtures Inside Hoods: Acid- and solvent-resistant coating applied by fixture manufacturer.

G. Electrical Receptacles: Hospital-grade; ANSI/NEMA WD 6 Configuration 5-20R; duplex; with chrome-plated brass or stainless-steel cover plates; minimum 120 V, 20 A.

PART 3 – EXECUTION

3.1 PREPARATION

Install equipment after installation of finish flooring in rooms to receive cabinets has been completed.

3.2 INSTALLATION

A. General:

1. Install biohazard safety cabinets and LAFWs according to manufacturer's written instructions
2. Coordinate installation with related mechanical and electrical work. Provide cutouts and openings for plumbing and electrical work as indicated or as required by trades involved.
3. Install level, plumb, true, and straight without distortion.
   a. Shim cabinets using concealed shims.
4. Adjust hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended in writing by manufacturer.
5. Locate unit away from fans, heating and air conditioning registers, laboratory hoods, high traffic areas and doors that could interfere with airflow patterns.

3.3 TESTING

A. Biological Safety Cabinets: After installation, an independent accredited service technician must test the biological safety cabinet according to NSF 49 and permanently attach certificate of compliance to equipment.

B. Laminar Airflow Work Stations: After installation, an independent accredited service technician must test the laminar flow work station and provide a written report certifying that it provides an ISO 5/Class 100 clean air environment.

3.4 PROTECTING AND CLEANING

A. Protect equipment from dirt, water, and chemical or mechanical injury during the remainder of the construction period.

B. At the completion of work, clean equipment as required to produce ready-for-use condition.

3.5 INSTRUCTIONS

Instruct personnel and transmit operating instructions in accordance with requirements in specification.

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SECTION 122413
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Motor-operated roller shades with single rollers and with double rollers.

B. Related Requirements:

   1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
   2. Division 07 Section "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.
   3. Division 26 Sections for electrical service and connections for motors, controls, limit switches, and other powered devices and for system disconnect switches for motor-operated shades.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

   1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.

   1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.

   1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark inside face of material if applicable.
   2. Roller Shade: Full-size operating unit, not less than 16 inches (400 mm) wide by 36 inches (900 mm) long for each type of roller shade indicated.

3. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

F. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide: MecoShade Systems, Inc. or comparable product by one of the following:
   1. Draper Inc.
   2. Hunter Douglas Contract.
   3. Lutron Electronics Co., Inc.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MOTOR-OPERATED, SINGLE-ROLLER SHADES

A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

   1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.

      a. Electrical Characteristics: Single phase, 110 V, 60 Hz.
      b. Individual Switch Control Station: Maintained-contact, wall-switch-operated control station with open, close, and center off functions.
      c. Color: As selected by Architect from manufacturer's full range.
   3. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
   4. Operating Features:
      a. Override switch.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of inside face of shadeCoordinate direction of roll with fascia, headbox, or shade-pocket design.
2. Direction of Shadeband Roll: Regular, from back of roller.
3. Shadeband-to-Roller Attachment: mechanically fastened

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.

E. Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material
b. Color and Finish: As selected by Architect from manufacturer's full range.

F. Installation Accessories:
1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 6 inches (152 mm).
b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.

a. Closure-Panel Width: 2 inches (51 mm).
3. Installation Accessories Color and Finish: As selected from manufacturer's full range

2.3 MOTOR-OPERATED, DOUBLE-ROLLER SHADES

A. Motorized Operating Systems: Provide factory-assembled, shade-operator systems of size and capacity and with features,

characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard tubular, enclosed in rollers.

    a. Electrical Characteristics: Single phase, 110 V, 60 Hz.
    b. Individual Switch Control Station: Maintained-contact, , wall-switch-operated control station with open, close, and center off functions.
    c. Color: As selected by Architect from manufacturer's full range.
3. Limit Switches: Adjustable switches, interlocked with motor controls and set to stop shade movement automatically at fully raised and fully lowered positions.
4. Operating Features:
    a. Override switch.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shades for service.

1. Double-Roller Mounting Configuration: Offset, outside shade over and inside shade under.
2. Inside Roller:

    a. Drive-End Location: Right side of inside face of shade.
    b. Direction of Shadeband Roll: Regular, from back of roller

3. Outside Roller:

    a. Drive-End Location: Right side of inside face of shade.
    b. Direction of Shadeband Roll: Regular, from back of roller.

4. Shadeband-to-Roller Attachment: mechanically fastened.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: As selected by Architect from manufacturer's full range.

F. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Installation Accessories:

1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 6 inches (152 mm).
   b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recesses or pockets and for snap-in attachment to wall clip without fasteners.

   a. Closure-Panel Width: As indicated on Drawings.

3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
4. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
5. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.
2. Type: EcoVeil by Mecoshade or equal.
3. Orientation on Shadeband: Up the bolt.
4. Openness Factor: 1 percent.
5. Color: As selected by Architect from manufacturer's full range.

C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.
2. Type: Blackout by MecoShade - opaque.
3. Orientation on Shadeband: Up the bolt.
4. Features: Washable Antistatic treatment.
5. Color: As selected by Architect from manufacturer's full range.

2.5 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational

clearances, [accurate locations of connections to building electrical system,]and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END

SECTION 12 31 00
MANUFACTURED METAL CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies metal casework and related accessories, including base cabinets, wall cabinets, and full height cabinets.

B. Items specified in this section:

1. Laboratory Casework: Prefixed by "VL" AND "M", including metal casework of the following types:
   a. Wardrobe Cabinet, Metal, 5A (SD123100-02).
   b. Wall Cabinet, Metal, 5B (SD123100-01).
2. Laboratory Casework: Prefixed by "SS", including stainless steel casework of the following types:
   b. Environmental Rooms
   b. Glass Wash Room

1.2 RELATED WORK

A. Color of casework finish: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Electrical Components: Division 26, ELECTRICAL.

1.3 QUALITY ASSURANCE

A. Approval by Contracting Officer of proposed manufacturer, or suppliers, will be based upon submission by Contractor certification that, manufacturer regularly and presently manufactures casework specified as one of their principal products.

B. Installer has technical qualifications, experience, trained personnel, and facilities to install specified items.

C. Furnish supervision of installation at construction site by a qualified technician regularly employed by casework installer.

1.4 SUBMITTALS

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

B. Certificates:

1. Manufacturer's Certificate of qualifications specified and finish on casework.
2. Contractor's Certificate of installer’s qualifications specified.
3. Safety glass meets requirements of ANSI Standard Z97.1.

C. Manufacturer's Literature and Data:

1. Brochures showing name and address of manufacturer, and catalog or model number of each item incorporated into the work.

2. Manufacturer's illustration and detailed description.
3. List of deviations from contract specifications.
4. Locks, each kind

D. Shop Drawings (1/2 Full Scale):
1. Showing details of casework construction, including kinds of materials and finish, hardware, accessories and relation to finish of adjacent construction, including specially fabricated items or components.
2. Fastenings and method of installation.
3. Location of service connections and access.

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

1.5 APPLICABLE PUBLICATIONS

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

SPEC WRITER NOTE: Update applicable publications to current issue at time of project specification preparation.

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

A36/A36M-08.....Carbon Structural Steel

A167-99(R 2009).....Stainless and Heat-Resisting Chromium Steel Plate Sheet and Strip

A283/A283M-03(R 2007)...Low and Intermediate Tensile Strength Carbon Steel Plates

A568/A568M-09.....Steel, Sheet, Carbon and High-Strength, Low-Alloy Hot-Rolled and Cold-Rolled, General Requirements

A794/A794M-09.....Standard Specification for Commercial Steel (CS), Sheet, Carbon (0.16% Maximum to 0.25% Maximum) Cold Rolled

B456-03(R2009).....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

C1036-06.....Flat Glass

C. American National Standard Institute:

Z97.1-09.....Safety Glazing Material used In Buildings

D. Builders Hardware Manufacturers Association (BHMA):

A156.1-06.....Butts and Hinges

A156.9-10.....Cabinet Hardware

A156.5-10.....Auxiliary Locks and Associated Products

A156.11-10.....Cabinet Locks

A156.16-02.....Auxiliary Hardware

E. American Welding Society (AWS):

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

D1.3-08.....Structural Welding Code Sheet Steel

F. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-505-06 Series...Metal Finishes Manual

G. U.S. Department of Commerce, Product Standard (PS):

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

H. Federal Specifications (Fed. Spec.):

FF-N-836D.....Nut, Square, Hexagon Cap, Slotted, Castle Knurled, Welding and Single Ball Seat

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

SPEC WRITER NOTES:
1. Update materials requirements to agree with applicable requirements (types, grades, classes,) specified in referenced Applicable Publications.
2. Coordinate and edit to certain only that which applies to project in parts 1 and 2.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet Steel:

1. ASTM A794, cold rolled, Class 1 finish, stretcher leveled.
2. Other types of cold rolled steel meeting requirements of ASTM A568 may be used for concealed parts.

B. Structural Steel: ASTM A283 or ASTM A36.

C. Stainless Steel: ASTM A167, Type 302B.

D. Glass:

1. ASTM C1036 Type I, Class 1, Quality q3,
2. For Doors: 6 mm (1/4 inch) thick; except where laminated glass is shown.

3. For shelves: Either 6 mm (1/4 inch) or 9 mm (3/8 inch) thick.

E. Laminated Glass: Fabricate of two sheets of 3 mm (1/8 inch) thick clear glass, laminated together with a 1.5 mm (0.060 inch) thick vinyl interlayer, to a total overall thickness of 8 mm (5/16 inch).

F. Glazing Cushions:
1. Channel shaped, of rubber, vinyl or polyethylene plastic, with vertical flanges not less than 2 mm (3/32 inch) thick and horizontal web 3 mm (1/8 inch) thick.
2. Flanges may have bulbous terminals above the glazing heads or terminate flush with top of beads.

G. Plywood:
1. Prod. Std. PS 1, seven ply, interior.
2. Where both sides are exposed, use Grade AA.
3. Grade AB for other uses.

H. Fasteners:
1. Exposed to view, chrome plated steel or stainless steel, or finished to match adjacent surface.
2. Use round head or countersunk fasteners where exposed in cabinets.
3. Expansion Bolts: Fed Spec. A-A-55615. Do not use lead or plastic shields.
4. Nuts: Fed Spec FF-N-836. Type III, Style 15 where exposed.
5. Sex Bolts: Capable of supporting twice the load.

2.2 MANUFACTURED PRODUCTS

A. When two or more units are required, use products of one manufacturer.

B. Manufacturer of equipment assemblies, which include components made by other, shall assume complete responsibility for the final assembled unit.

C. Constituent parts which are alike, use products of a single manufacturer.

2.3 CASEWORK FABRICATION

A. General:
1. Welding: Comply with AWS Standards.
2. Reinforce with angles, channels, and gussets to support intended loads, notch tightly, fit and weld joints.
3. Constructed of sheet steel, except where reinforcing required.

B. Minimum Steel Thickness:

0.89 mm (0.035 inch) (20 gage)	Drawer fronts, backs, bodies, closure plates or scribe and filler strips less than 75 mm (three inches) wide, sloping top, shelf reinforcement channel and shelves. Toe space or casework soffits and ceilings under sloping tops.
1.20 mm (0.047 inch) (18 gage)	Base pedestals, casework top sides, back, and bottom panels, closure scribe and filler strips 75 mm (three inches) or more. Reinforcement for drawers with locks. Tables legs, spreaders and stretchers, when fabricated of cold rolled tubing. Metal for desks; except legs and aprons. Door exterior and interior panels, flush or glazed. Cross rails of base units. Front bottom rails, back bottom rails; rails may be 1.49 mm (0.059 inch) (16 gage) thick. Uprights or posts. Top corner gussets.
1.49 mm (0.059 inch) (16 gage)	Aprons, apron division, reinforcing gussets, table legs, desk legs and aprons, spreaders and stretchers when formed without welding. Toe base gussets, drawer slides, and other metal work. Front top rails and back rails except top back rails may be 1.2 mm (0.047 inch) (18 gage) thick.
1.88 mm (0.074 inch) (14 gage)	Drawer runners door tracks.
2.64 mm (0.104 inch) (12 gage)	Base unit bottom corner gussets and leg sockets.
3 mm (0.12 inch) (11 gage)	Reinforcement for hinge reinforcement inside doors and cabinets.

C. Casework Construction:

1. Welded assembly.
2. Fabricate with enclosed uprights or posts full height or width at front, include sides, backs, bottoms, soffits, ceilings under sloping tops, headers and rail, assembled to form an integral unit.
3. Form sides to make rabbeted stile 19 to 28 mm (3/4 to 1-1/8 inch) wide, closed by channel containing shelf adjustment slots.
4. Make bottom of walls units flush, double panel construction.
5. Make top and cross rails of "U" shaped channel.
6. Provide enclosed backs and bottoms in cabinets, including drawer units.
7. Provide finish panel on exposed cabinet backs.
8. Do not use screws and bolts in construction or assembly of casework, except to secure hardware, applied door stops, accessories, removable

panels and where casework is required to fastened end to end or back to back.

9. Fabricate casework, except benches, and desks with finished end panels.
10. Close flush exposed soffits of wall hung shelving, knee spaces in counters, and toe spaces at bases.
11. In base units with sinks provide one piece, lowered backs.
12. In base units with doors provide removable backs.
13. Provide built-in raceways or tubular or channel shaped members of casework for installation of wiring and electric work. Mount junction boxes on rear of cabinets, Electric work is specified in electrical sections of specifications.
14. Provide reinforcing for hardware.
15. Size Dimensions:
    a. Used dimensions shown or specified within tolerances specified.
    b. Tolerance:
        1) Depth: 325 mm (13 inches) in lieu of 300 mm (12 inches), 450 mm (18 inches) in lieu of 400 mm (16 inches), except wall hung units above counter. 525 mm (21 inches) to 600 mm (24 inches) in lieu of 550 mm (22 inches).
        2) Width: Minus 25 mm (one inch).
        3) Height: 25 mm (one inch) plus or minus for wall hung cabinets and counter mounted cabinets, excluding sloping tops. 25 mm (one inch) plus for floor standing cabinets, excluding base and sloping tops. Full height cabinets shown back to back same height.
        4) Manufacturer's tolerance for the same length, depth or height: Not to exceed 1.58 mm (0.0625 inches).

D. Base Pedestals:
1. Provide adjustable leveling bolts accessible through stainless steel plugs, or notch in the base concealed when resilient base is applied.
2. Except where flush metal base is shown, provide toe space at front recessed 75 mm (3 inches).

E. Doors:
1. Hollow metal type, flush and glazed doors not less than 16 mm (5/8 inch) thick.
2. Fabricate flush metal doors of two panels formed into pans with corners welded and ground smooth. Provide flush doors with a sound deadening core.

3. Fabricate glazed metal doors with reinforced frame and construct either from one piece of steel, or have separate stiles and rails mitered and welded at corners, and welds ground smooth.
   a. Secure removable glazing members with screws to back of doors.
   b. Install glass in rubber or plastic glazing channels.
4. Provide sheet steel hinge reinforcement inside doors.
5. Sliding doors: Provide stops to prevent bypass.
6. Doors removable without use of tools except where equipped with locks.

F. Drawers:
1. Drawer fronts flush hollow metal type not less than 16 mm (5/8 inch) thick with sound deadening core. Fabricate of two panels formed into pans. Weld and grind smooth corners of drawer fronts.
2. Form bodies from one piece of steel, weld to drawer front.
3. Provide reinforcement for locks and provide rubber bumpers at both sides of drawer head to cushion closing.
4. Equip with roller suspension guides.

G. Sloping Tops:
1. Provide sloping tops for casework where shown.
2. Where ceilings interfere with installation of sloping tops. Provide filler plates as specified.
3. Omit sloping tops or filler plates whenever ceiling material is turned down and furred-in at face of casework.
4. Provide exposed ends of sloping tops with flush closures.
5. Fasten sloping tops with sheet metal screws inserted from cabinet interior; space fastener as recommended by manufacturer.

H. Shelves:
1. Capable of supporting an evenly distributed minimum load of 122 kg/m^2 (twenty-five pounds per square foot) without visible distortion.
2. Flange shelves down 19 mm (3/4 inch) on edges, with front and bearing edges flanged back 13 mm (1/2 inch).
3. For shelves over 1050 mm (42 inches) in length and over 300 mm (12 inches) in depth install 38 mm by 13 mm by 0.9 mm (1-1/2 x 1/2 x 0.0359 inch) thick sheet steel hat channel reinforcement welded to underside midway between front and back and extending full length of shelf.
4. Weld shelves to metal back and ends unless shown adjustable.
5. Provide means of positive locking shelf in position, and to permit adjustment without use of tools.

6. On pharmacy on sloping shelf provide 13 mm (1/2 inch) wide clear acrylic plastic raised edge, 3 mm (1/8 inch) thick, secured to front edge of shelf.

I. Undercounter Table and Bench Frames:
1. Using welded construction.
2. Open frame type with aprons and legs when required.
3. Aprons:
   a. Channels shaped welded at corners, with leg sockets and reinforcing triangular corner gussets welded in corners.
   b. Pierce sockets to receive leg bolts and notch gussets to receive legs.
   c. Upper flange perforated or slotted to receive screws at 200 mm (8 inch) centers, and back channels when installed against wall. Size slots for 6 mm (1/4 inch) anchor bolts.
   d. Pierce aprons to receive drawer formation, rail at top of drawer opening. Install channel shaped apron division welded at ends, 762 mm 30 inches apart to front and back aprons, or at each side of drawer.
   e. Fabricate metal components from sheet steel.
      1) Use 1.5 mm (0.0598 inch) thick sheet for gussets and channel aprons.
      2) Use 1.2 mm (0.0478 inch) thick sheet for other items.
   f. At knee space, provide exposed metal sides and metal closure plate for soffit. Where shown at knee space, provide exposed metal back secured with continuous angle closures at both side.
4. Legs:
   a. Cold rolled tubing or 1.5 mm (0.0598 inch) formed steel.
   b. Leveling-anchoring device at floor.
   c. Stud bolt at top for attachment to leg socket.
5. Leg Braces:
   a. Tables and benches not anchored to walls.
   b. Brace back against front legs near bottom with steel angle, channel or tubular braces.
   c. Fasten braces together with steel straps.
6. Leg Shoes:
   a. Fit laboratory casework legs at bottom with either stainless steel, aluminum, or chromium plated brass shoes, not less than 25 mm (one inch) in height.
   b. Fit other legs with a movable molded vinyl shoe 100 mm (four inches) high and coved at bottom.

J. Closures and Filler Strips at Pipe Spaces:
   1. Flat steel strips or plates.
   2. Openings less than 200 mm (8 inches) wide: 1.2 mm (0.047 inch) thick.
   3. Openings more than 200 mm (8 inches wide 0.9 mm (0.359 inches) wide.

2.4 ACCESSORIES

A. Card or Label Holders for Shelves:
   1. Fabricate of 0.6 mm (0.0239 inch) thick steel approximately 125 mm (five inches) long, or continuous where shown, having top and bottom edges bent over on face and welded to shelf.
   2. Finish exposed surfaces in same color as shelf.

B. Labels Holders for Doors and Drawers:
   1. Cast or wrought brass or aluminum, 50 mm (2 inch) by 88 mm (3-1/2 inch).
   2. Fasten to casework as recommended by manufacturer.

C. Shadow Boards in Cabinet VL 33:
   1. Plywood of size and thickness shown with exposed edges chamfered.
   2. Secure boards to back of exterior metal doors and cabinet back with screws.
   3. Use pivot top and bottom hinges on intermediate boards with pulls on each leaf.
   4. Paint exposed surfaces of shadow boards two shop coats of shellac.

2.5 HARDWARE

A. Factory installed.

B. Exposed hardware, except as specified otherwise, satin finished chromium plated brass or nickel plated brass or anodized aluminum.

SPEC WRITER NOTE: Verify locks are shown on details for cabinets.

C. Cabinet Locks:
   1. Where locks are shown.
   2. Locked pair of hinged door over 900 mm (36 inches) high:
      a. ANSI/BHMA A156.5, similar to E0261, Key one side.
      b. On active leaf use three-point locking device, consisting of two steel rods and lever controlled cam at lock, to operate by lever having lock cylinder housed therein.
      c. On inactive leaf use dummy lever of same design.
      d. Provide keeper holes for locking device rods and cam.
      //e. Use two point locking device both doors of cabinet 6D similar to ANSI/BHAMA A156.5, E0251, Key one side. //
   3. Door and Drawer: ANSI/BHMA A156.11 cam locks.

a. Drawer and Hinged Door up to 900 mm (36 inches) high: E07261.
b. Pin-tumbler, cylinder type lock with not less than four pins. Disc tumbler lock "duo A" with brass working parts and case, as manufactured by Illinois Lock Company are acceptable.
c. Sliding Door: E07161.

4. Key locks differently for each type casework and master key for each service, such as Nursing Units, // Psychiatric, // Administrative, // Pharmacy //.
   a. Key drug locker inner door different from outer door.
   b. Provide two keys per lock.
   c. Provide six master keys per service or Nursing Unit.
5. Marking of Locks and Keys:
   a. Name of manufacturer, or trademark which can readily be identified legibly marked on each lock and key change number marked on exposed face of lock.
   b. Key change numbers stamped on keys.
   c. Key change numbers to provide sufficient information for manufacturer to replace key.

D. Cabinet Hardware: ANSI BHMA A156.9.
1. Door/Drawer Pulls: B02011.
   a. One for drawers up to 575 mm (23 inches) wide.
   b. Two for drawers over 575 mm (23 inches) wide.
   c. Sliding door flush pull, each door: B02201.
2. Door in seismic zones: B03352.
   a. Do not provide thumb latch on doors equipped with three point locking device.
   b. Use lever operated two point latching device on paired doors over 900 mm (36 inches) high if three point locking or latching device is not used.
3. Cabinet Door Catch:
   a. Install at bottom of wall cabinets, top of base cabinets and top and bottom of full height cabinet doors over 1200 mm (48 inches).
   b. Omit on doors with locks.
4. Drawer Slides:
   a. Use B05051 for drawers over 150 mm (6 inches) deep.
   b. Use B05052 for drawers 75 to 150 mm (3 to 6 inches) deep.
   c. Use B05053 for drawers less than 75 mm (3 inches) deep.
5. Butt Hinges:
   a. B01351, minimum 1.8 mm (0.072 inch) thick chrome plated steel leaves.

b. Minimum 3.5 mm (0.139 inch) diameter stainless steel pins.
c. Full mortise type, five knuckle design with 63 mm (2-1/2 inch) high leaves and hospital type tips.
d. Two hinges per door except use three hinges on doors 1200 mm (48 inches) and more in height. Use stainless steel leaves for tilting bin doors.
f. Do not weld hinges to doors or cabinets.

6. Pivot hinges: ANSI/BHMA A156.1 A875B.
7. Shelf Supports:
   a. install in casework where adjustable shelves are noted.
   b. Adjustable Shelf Standards: B04061 with shelf rest B04081.
   c. Vertical Slotted Shelf Standard: B04102 with shelf brackets B04112 sized for shelf depth.
8. Sliding Doors:
   a. Doors supported by two ball bearing bronze or nylon rollers or sheaves riding on a stainless steel track.
   b. Sliding Door Tracks: B07093. Plastic tracks not acceptable.
   c. Doors restrained by a nylon, polyvinylchloride, or stainless steel guide at opposite end.
9. Auxiliary Hardware: ANSI A156.16.
10. Door silencers: LO3011 or LO3031.
    a. Install two rubber bumpers each door.
    b. Silencers set near top and bottom of jamb.
11. Closet Bar: L03131 chrome finish of required length.

2.6 METAL FINISHES

A. Comply with NAAMM 500 series and as specified.
B. Steel Cabinets including Closures and Filler Strips:
   1. Acid resisting finish except hardware and stainless steel.
   2. After fabrication of cabinet submerge in a degreasing bath, and thoroughly rinse to remove dirt and grease, and other foreign matter.
   3. Apply non-metallic phosphate coating, then finish with baked-on acid resisting enamel not less than one mil thick.
   4. Finish resistant to action of the following reagents when 10 drops (0.5 cm^3) are applied to the surface and left open to the atmosphere for period of one hour.

Hydrochloric Acid 37 percent	Ethyl Alcohol
Phosphoric Acid 75 percent	Methylethyl Keytone
Sulfuric Acid 25 percent	Acetone
Glacial Acetic Acid	Ethyl Acetate
Sodium Hydroxide 10 percent	Ethyl Ether
Sodium Hydroxide (concentrated)	Carbon Tetrachloride
Ammonia Hydroxide (concentrated)	Xylene
Hydrogen Peroxide 5 percent	Phenol 85 Percent
Formaldehyde 37 percent	

5. Color of finish is specified in Section, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES.

C. Brass:
1. U.S. Standard Finish No. 26 for hardware items.
2. Other brass items: ASTM B456, chromium plated finish meeting requirements for Service Condition SCI.

D. Aluminum: Chemically etched medium matte, clear anodic coating, Class II, Architectural, 0.4 mils thick.

E. Stainless Steel: Mechanical finish No. 4 on sheet except No. 7 on tubing.

2.7 DISPENSING TRAYS AND BINS

A. Design trays and bins to fit cabinets where shown.

B. Fabricate of steel, polypropylene, fiberglass reinforced polyester resin, or other suitable material.

C. Lock securely in place without the use of tools.

D. Fit at angle to provide gravity feed where shown.

E. Dispensing Trays:
1. Equip trays with two longitudinal dividers adjustable to three position.
2. Approximate dimensions: 150 mm (6 inches) in width 75 mm (3 inches) in depth, and length to suit cabinets depth furnished.

F. Dispensing Bins:
1. Open front, except for retaining rim.
2. Approximate dimensions: 150 mm (6 inches) in width, 125 mm (5 inches) in depth, and length to suit cabinets furnished.

2.8 ELECTRICAL FIXTURES

A. Comply with requirements of Division 26 – ELECTRICAL specifications for fixtures, receptacles, wiring and junction boxes required for fixtures and receptacles, included with casework.

B. Suitable for use with electrical system specified and shown.

C. Factory install in casework.

2.9 VL 33

A. Construct as shown.

B. Use pivot hinges on center shadow boards, secured to bottom and top of cabinet with bolts or screws.

2.10 SUSPENSION SYSTEM FOR INTERCHANGEABLE CASEWORK:

A. Suspension system shall provide for independent suspension of interchangeable under-counter cabinets and of countertops. Provide for removal or exchange of under counter cabinets of various heights, widths and types, and for vertical adjustment of counter tops to heights indicated on drawings.

B. Suspension Frames: Fabricate of 32 mm (1-1/4 inch square) or 25 mm (1 inch) x 38 mm (1-1/2 inch) rectangular, 2.6 mm (0.104 inch) (12 gauge) steel tubing welded to form full rectangle. Provide integral, adjustable leveling device in steel leg with non marring foot cap.

C. Mounting channels and support frames shall allow for pipe chases and service channels when required.

D. Cabinets to have an 1.49 mm (0.059 inch) steel shaped form welded across entire width of back to engage continuous slot in wall mounting channel. Two fastening devices through case stile at front shall provide final positive location and locking of case in position.

E. All construction materials that are exposed shall be painted.

2.11 WHEELED CARRIER

Provide a wheeled carrier to facilitate installation, removal, and transport of interchangeable cases as part of the interchangeable laboratory furniture system.

PART 3 - EXECUTION

3.1 COORDINATION

A. Before installing casework, verify wall and floor surfaces covered by casework have been finished.

B. Verify location and size of mechanical and electrical services as required.

C. Verify reinforcement of walls and partitions for support and anchorage of casework.

3.2 FASTENINGS AND ANCHORAGE

A. Do not anchor to wood ground strips.

B. Provide hat shape metal spacers where fasteners span gaps or spaces.

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

3.3 CLOSURES AND FILLER PLATES

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

E. Caulk and seal laboratory furniture as specified in Section 07 92 00, JOINT SEALANTS.

3.4 CABINETS

A. Install in available space; arranged for safe and convenient operation and maintenance.

B. Align cabinets for flush joints except where shown otherwise.

C. Install cabinets level with bottom of wall cabinets in alignment and tops of base cabinets aligned.

D. Install corner cabinets with hinges on corner side with filler or spacers sufficient to allow opening of drawers.

E. Plug Buttons:

1. Install plug buttons in predrilled or prepunched perforations not used.
2. Use chromium plate plug buttons or buttons finish to match adjacent surfaces.

F. Cabinets 6D: Ground to nearest cold water pipe in accordance with NFPA, Underwriters Laboratories, Inc., or other nationally recognized laboratory approved ground specified system.

3.5 PROTECTION TO FIXTURES, MATERIALS, AND EQUIPMENT

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

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

- - - E N D - - -

SECTION 12 32 00
MANUFACTURED WOOD CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies wood veneer casework as detailed on the drawings, including related components and accessories required to form integral units. Wood casework items shown on the drawings, but not specified below shall be included as part of the work under this section, and applicable portions of the specification shall apply to these items. Each like item of casework shall be of the same design and by one manufacturer.

B. Where shown, provide wood veneer casework items as follows:
   1. Fixed Wall cabinets and base cabinets.
   2. Mobile Cabinets.
   3. Solvent (Flammable) Storage Cabinets.

1.2 RELATED WORK

A. Custom Casework: Section 06 20 00, FINISH CARPENTRY.

B. Countertops and Lab Fixtures: Section 12 36 00, COUNTERTOPS AND FIXTURES

C. Lavatories and Plumbing in Casework: Section 22 40 00, PLUMBING FIXTURES.

1.3 MANUFACTURER'S QUALIFICATIONS

The fabrication of casework shall be by a manufacturer who produces casework similar to the casework specified and shown.

1.4 SUBMITTALS

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

B. Manufacturer's Literature and Data:
   Sinks, trim and fittings.
   Locks for doors and drawers
   Adhesive cements

C. Samples:
   Counter top, plastic laminate, 150 mm (six inch) square
   Wood Face Veneer or Hardwood Plywood

D. Shop Drawings (1/2 full size):
   1. All casework, showing details of construction, including materials, hardware and accessories.

2. Cabinets and counters showing faucets in connection with sink bowls, and electrical fixtures and receptacles which are mounted on cabinets and counters.
3. Fastenings and method of installation.

1.5 APPLICABLE PUBLICATIONS

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

B. American Society for Testing and Materials (ASTM):
A167-99 (R2009).....Stainless and Heat-Resisting chromium-Nickel Steel Plate, Sheet and Strip
A1008-10.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy
C1036-06.....Flat Glass

C. Composite Panel Association (CPA):
A208.1-09.....Particleboard

D. U.S. Department of Commerce Product Standards (Prod. Std):
PS1-95.....Construction and Industrial Plywood

E. Hardwood, Plywood and Veneer Association (HPVA):
HP-1-09.....Hardwood and Decorative Plywood

F. Architectural Woodwork Institute (AWI):
Architectural Woodwork Quality Standards, Guide Specifications Quality Certification Program - 1999

G. American Society of Mechanical Engineers (ASME):
A112.18.1-05.....Plumbing Fixture Fittings

H. National Electrical Manufacturers Association (NEMA):
LD3-05.....High Pressure Decorative Laminates
LD3.1-95.....Performance, Application Fabrication and Installations of High-Pressure Decorative Laminates

PART 2 - PRODUCTS

2.1 PLYWOOD, HARDWOOD FACE VENEER

HPVA HP-1, Premium Grade: Plain-Sliced Maple. Vertical, Matched Grain

2.2 PLYWOOD, SOFTWOOD

Prod. Std. PS1, five ply construction from 13 mm to 28 mm (1/2 inch to 1-1/8 inch) thickness, and seven ply for 31 mm (1 1/4 inch) thickness.

2.3 PARTICLEBOARD

CPA A208.1, Type 1, Grade 1-M-3.

2.4 RUBBER OR VINYL BASE

Straight (for carpet), cove (for resilient floor); 100 mm (4 inch) high, 3 mm (1/8 inch) thick, flexible to conform to irregularities in walls, partitions and floors.

2.5 GLASS: ASTM C1036

For Doors: Type I, Class 1, Quality q4.

2.6 SOLID WOOD

Wood required for edge banding, moldings and legs shall be of same species as wood face veneer.

2.7 SHEET STEEL

ASTM A1008.

2.8 STAINLESS STEEL

ASTM A167, with No. 4 finish.

2.9 HARDWARE

A. Where pin tumbler locks are indicated, disc tumbler lock "Duo A", with brass working parts and case, as manufactured by the Illinois Lock Company will be an acceptable substitute. Locks for each type casework, shall be keyed differently and shall be master-keyed for each type service. Provide two keys for each lock. Exposed hardware, except as otherwise specified, shall be satin finished chromium plated brass or nickel plated brass.

B. Marking of Locks and Keys:
   1. The name of the manufacturer, or trademark by which manufacturer can readily be identified, legibly marked on each lock.
   2. The key change number marked on the exposed face of lock, and also stamped on each key.
   3. Key change numbers shall provide sufficient information for replacement of the key by the manufacturer.

C. Hinged Doors:
   1. Doors 900 mm (36 inches) and more in height shall have three hinges and doors less than 900 mm (36 inches) in height shall have two hinges. Each door shall close against two rubber bumpers.
   2. Hinges: Fabricate hinges with minimum 2 mm (0.072 inch) thick chromium plated steel leaves, and with minimum 3.5 mm (0.139 inch) diameter stainless steel pin. Hinges shall be five knuckle design with 63 mm (2-1/2 inch) high leaves and hospital type tips.

3. Fasteners: Provide full thread wood screws to fasten hinge leaves to door and cabinet frame. Finish screws to match finish of hinges.

D. Door Catches:
1. Friction or Magnetic type, fabricated with metal housing.
2. Provide one catch for cabinet doors 1200 mm (48 inches) high and under, and two for doors over 1200 mm (48 inches) high.

E. Locks:
1. Cylinder type pin tumbler.
2. Equip doors and drawers where shown with locks.

F. Drawer and Door Pulls:
Doors and drawers shall have stainless steel wire.

G. Drawer Slides:
1. Full extension steel slides with nylon ball-bearing rollers.
2. Slides shall have positive stop.
3. Equip drawers with rubber bumpers.

H. Shelf Standards (Except For Fixed Shelves):
Bright zinc-plated steel for recessed mounting with screws, 16 mm (5/8 inch) wide by 5 mm (3/16 inch) high providing 13 mm (1/2 inch) adjustment, complete with shelf supports.

2.12 FABRICATION

A. Casework shall be of the flush overlay being of premium grade construction and of component thickness in conformance with AWI Quality Standards.

B. Fabricate casework of factory finished wood veneer as follows:
1. Where shown, gates, doors, drawers, shelves and all semi-concealed surfaces shall be wood veneer.
2. Glazed doors shall have 5 mm (3/16 inch) thick glass, set in glazing compound.

C. Electrical fixtures, receptacles, wiring and junction boxes required for fixtures and receptacles:
1. Factory installed in casework.
2. For electrical lighting fixtures, see drawings.
3. For electric receptacles and lighting fixtures installed below or adjacent to wall cabinets or above counter tops, see electrical sections or specifications.
4. Install wiring in built-in raceways and terminate at junction box mounted on rear of cabinet and counter.

5. For final hook-up at junction box see electrical sections of specifications.

D. Base:
1. Provide rubber or vinyl base with close, flush joints; set with adhesive.
2. Remove adhesive from exposed surfaces.
3. Install base at floor line after casework has been accurately leveled.
4. Rub base to glossy finish.

E. Support Members for Tops of Tables:
1. Construct as detailed.
2. Provide miscellaneous steel members and anchor as shown.

F. Legs for Counters:
1. Fabricate legs for counters of 1.6 mm (0.0635 inch) thick, 38 mm (1-1/2 inch) square tubular stainless steel where shown.
2. Secure legs to counter tops and provide legs at bottom with shoes not less than 25 mm (one inch) in height.
3. Fabricate shoes of stainless steel.

2.13 MOBILE BASE CABINETS

A. Design requirements, performance requirements, materials, fabrication and hardware shall comply in all respects with fixed wood and/or steel casework specifications as manufactured and cataloged.

B. Cabinets with casters shall be constructed without toe spaces. The cabinet shall be constructed with a reinforced base capable of supporting a 4″ high caster assembly in each corner. Casters shall be swivel locking type and rated for minimum 250 pounds load each. Cabinets with casters shall be completely finished on four sides and top since surfaces are considered visible.

C. The entire cabinet assembly shall be reinforced to permit mobility without twisting and achieve an industry standard height of 31″ or 37″ including the flush 1″ counter top.

D. Base cabinets shall, except as noted, incorporate a flush overlay design in which the cabinet body is completely concealed.

E. The mobile base unit shall incorporate a 6″ high “Add-A-Drawer” furniture design to allow the casework to be used in both standing height and sitting height configuration and shall be constructed as follows:

1. Base cabinet shall be nominally 29″ high.

2. A 6″ high, fully enclosed drawer box made to the same widths as the cabinet below shall sit on top of each base cabinet to create a standing height cabinet. The drawer box frame shall be ¾″ thick on all four sides.

3. The drawer box frame shall be aligned with two mechanical pins or fasteners that engage the cabinet's top rail through pre-drilled holes with metal inserts. In addition, a cam lock mechanism shall be located at the rear of the base cabinet to lock the add-a-drawer unit to the cabinet.

F. Units with drawers must be equipped with an anti-tipping mechanism that shall include an interlock so that only one drawer in a vertical stack can be opened at one time.

G. Provide ¾″ Epoxy resin tops to match countertops

2.14 SOLVENT (FLAMMABLE) STORAGE

A. Design and construct in accordance with OSHA regulations, FM, UL and NFPA 30, National Fire Protection Association, Flammable and Combustible Liquids Code. Cabinets shall be Factory Mutual (FM) approved and Underwriters (UL) listed with UL/FM approval label affixed to inside of cabinet door.

B. Design: Door overlay design, either flush, and face veneer species, either plain-sliced maple, shall be same as specified for wood laboratory casework.

C. Cabinet: Bottom, top, back, door(s) and sides of cabinet shall be constructed of 1-inch veneer core plywood. All joints shall be rabbetted and shall be fastened in two directions with wood screws.

D. Back: Floor mounted and suspended cabinets shall have removable back panels for access to utility chase from inside the cabinet. Floor mounted cabinets with flush top panel shall also incorporate the top panel as removable.

E. Door: Provide with five-knuckle hinges, manual three-point latch and door sill raised at least two inches above cabinet bottom to retain spilled liquid within the cabinet. When more than one door is used, there shall be an overlap of not less than 5/8".

F. Ventilation: Cabinet shall include two threaded, two-inch pipe vent outlets and flame arrestors on the back of the cabinet. Vent as required by local code.

G. Bottom: In addition to cabinet bottom, provide with minimum two-inch deep, lipped, removable, liquid tight, powder coated steel bottom pan.

H. Shelving: Provide with full width and full depth 3/4-inch thick adjustable shelf.

I. Identification: All solvent storage cabinets shall be marked with conspicuous, two-inch high lettering: FLAMMABLE - KEEP FIRE AWAY.

J. Finish: Finish as specified for wood laboratory casework.

K. Exterior color as selected by owner's representative from manufacturer's standard color selection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set casework in place; level, plumb and accurately scribe and secure to walls, and/or floors.

B. The installation shall be complete including all trim and hardware. Leave the casework clean and free from defects.

3.2 FASTENINGS

A. Fastenings for securing casework to adjoining construction shall be as detailed on the drawings or approved shop drawings.

B. See Section 05 50 00, METAL FABRICATIONS for reinforcement of walls and partitions for casework anchorage.

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SECTION 12 35 61
MANUFACTURED FLEXIBLE LAB CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Tables
   2. Support structures
   3. Shelves
   4. Tasklights
   5. Magnetic Marker Boards

B. Related sections:
   1. Section 01 53 13 - Alternates
   2. Section 11 53 13 - Laboratory Fume Hoods.
   3. Section 12 36 00– Countertops and Fixtures
   1. Section 12 32 00 – Manufactured Wood Laboratory Casework.
   2. Section 12 35 62 – Ceiling Manifold System.
   3. Division 22: Furnishing and installation of piping, drainline, traps, final connections and setting of sinks and fixtures.
   4. Division 23: Furnishing and installation of exhaust ductwork, transition(s), blowers and equipment, and final connection to fume hood(s).
   5. Division 27: Furnishing and installation of electrical utilities and final connections.

1.2 ALTERNATE PROPOSALS

A. Proposals are invited from alternate manufacturers only if they comply with the minimum design requirements and the minimum performance requirements set forth by SEFA and UL standards. A notarized letter stating full compliance must be included in alternate proposals signed by an independent testing laboratory recognized by ASTM E 548 to ensure compliance.

B. A copy of UL (Underwriters Laboratories) certification must be submitted with any alternate proposal noting full compliance to UL 962 testing and approvals.

1.3 SYSTEM DESIGN REQUIREMENTS

A. Modular dimensioned system of tubular frame style support structures, tables and cantilevered storage units.

B. Tubular Frames: Support structure for tables, shelves and service chase for all service lines, data and electrical cables.
   1. Modular units shall be suitable for wall, peninsula or island configurations.

2. Rear frame can be supported with structural tables or anchored to the wall structure.
3. Equipped with easy to remove work surface frame. Work surface frame can accommodate Add-A-Leg members to function as a free standing structural table.
4. Moveable bench system shall be pre-wired and pre-plumbed, equipped with cabling plug-ins and service line quick connects.

C. Tables Frames: Modular, interchangeable work surface support structures in both frame attached and free standing adjustable height configurations.
1. Adjustable height tables incorporate fixed mechanical adjustment.
2. Levelers are included on both free standing and adjustable height work surface frames.

D. System requirements:
1. The system shall consist of a welded framework with slotted uprights to support work surfaces and overhead shelving components and integrate with mobile undercounter cabinets.
2. Structural components are self-supporting and independent of the building structure.
3. Tubular frame structures support service fixtures, electrical/data outlets and supply lines utilizing the frame system as a utility chase.
4. The vertical height of table work surfaces and shelves can be adjusted from sitting to standing height in 2″ increments.
5. All services (plumbing, power, phone and data) terminate at the top of the vertical support.
6. All support frames shall bolt together or to the wall at the top horizontal rail.
7. The bench system shall ship complete with minimal final assembly. Assembly shall be accomplished with simple hand tools.

1.4 SUBMITTALS

A. Shop Drawings: Provide 3/4"=1'-0" scale elevations of all components, cross sections, rough-in and anchor placements, tolerances and clearances. Provide 1/4"= 1'-0" rough-in plan drawings for coordination with trades. Rough-in shall show free area.

1.5 QUALITY ASSURANCE

A. Single source responsibility: Laboratory furniture system, casework, work surfaces, laboratory equipment, chemical fume hoods and accessories shall be manufactured or furnished by a single laboratory furniture company.

B. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produced high quality laboratory casework and equipment, and shall meet the following minimum requirements:

1. Five years or more experience in manufacture of laboratory casework and equipment of similar product type specified.

C. Laboratory furniture systems and systems components must be *UL 962* submitted, approved and listed. Products must bear the UL Mark and shall be identified to those products that were evaluated by UL and found to comply with UL's requirements. The testing standard shall include Dielectric, Grounding Impedance, Stability, Strain Relief and Strength tests.

1.6 REFERENCE STANDARDS

A. All casework, worksurface and service fixture construction and performance characteristics shall be in full compliance with *SEFA* (Scientific Equipment and Furniture Association) standards. At the owner's request, independent, third party testing must be submitted validating compliance and adheres to the architectural specifications:
1. SEFA 2.3 – Installation of Scientific Laboratory Furniture and Equipment.
2. SEFA 3 – Work Surfaces
3. SEFA 7 – Laboratory and Hospital Fixtures
4. SEFA 8 – Laboratory Furniture

1.7 DELIVERY, STORAGE AND HANDLING

A. Schedule delivery of laboratory furniture system so that spaces are sufficiently complete that material can be installed immediately following delivery.

B. Protect finished surfaces from soiling or damage during handling and installation.

1.8 PROJECT CONDITIONS

A. Do not deliver or install equipment until the following conditions have been met:
1. Windows and doors are installed and the building is secure and weather tight.
2. Ceiling, overhead ductwork and lighting are installed.
3. All painting is completed and floor tile is installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design, materials, construction and finish of laboratory furniture specified is the minimum acceptable standard of quality for flexible laboratory casework.

2.2 WORKSURFACE TABLES FRAMES

A. General requirements for table frames:
   1. Work surface support frame: 2″ outside diameter wall and 1.75″ inner telescoping leg 11 gauge #304 stainless steel tubing. ASTM A513 type 1, 1010-1018 tubing. Levelers are 3/8″ - 16 nc X 2.5″ long.
      a. Finish: Chemical resistant urethane powder paint or #4 on the #304 stainless steel.
   2. Work surface support frame: 2″ outside diameter wall and 1.75″ inner telescoping leg 11 gauge stainless steel tubing. ASTM A554 type 304 stainless – polished to #4 finish. Levelers are 3/8″ - 16 nc X 2.5″ long.

B. Worksurface Table Frame:
   1. Nominal table frame dimensions:
      a. Width: Varies
      b. Depth: Individual tables 30" deep (27″ projecting in front of the uprights and 1″ behind the upright), or, 24″ deep at ADA stations.
      c. Adjustable Height: 30 to 37" AFF including .75″ thick top
   2. Front upright member is 2″ outside diameter, 11 ga. wall tubing with telescoping 11 ga. inner leg. The upright is capable of vertical adjustment in two-inch increments.
   3. Worksurface frames 11 ga. formed steel. Rear corners shall have 2.25″ diameter X 6″ high 11 ga. collar. The front half of the collar shall be welded to the worksurface frame with supporting gussets and the back half mechanically fastened to the rear uprights with socket head button cap and bolt.
   4. A back stop angle, with full length bumper, shall be located under the worksurface frame to position the 24″ deep mobile base cabinet 1″ behind the front edge of the worksurface.
   5. Load rating – 100 lbs. per linear foot of width to maximum of 800 lbs. With 800 lbs. of uniformly distributed load applied to an 8′ wide worksurface, the maximum allowable deflection shall be .125″ measured at the front center rail.

2.3 REAR FRAME SUPPORT STRUCTURE

A. General requirements for rear frame support structures:
   1. Vertical uprights shall allow for plumbing, electrical and data cabling
   2. Uprights supports shall be 11 ga. tubular steel 2″ outside diameter
   3. Levelers are 3/8″ - 16 nc X 2.5″ long.
   4. Rear frames (72″) shall have a center support to accommodate split shelving.
   5. Uprights have slots punched on 1″ increments starting at nominal 55″ above the floor to the top of the upright.
   6. Upper and lower horizontal cross rails shall be 11 ga. Steel.
   7. Lower structural cross rail shall house an integral two-channel raceway.
   8. Raceway to have 2 -20 amp hospital grade duplexes on 4′ and 3 – 20 amp hospital grade duplexes on 5′, 6′ and 8′ wide units and, where indicated on the drawings, a 20 amp duplex located in the vertical upright under the worksurface.
      a. Custom color to match table frame.

9. Wiring to the 20 amp duplexes is in one upright with plumbing, phone and data cables in the opposite upright support.

B. Rear Frame:
1. Nominal dimensions:
   a. Width: Varies
   b. Height: 84".

2.4 PLUMBING/FIXTURES

A. General requirements:
1. The table frame structure shall house a maximum of three plumbing services.
2. Needle Valves – chromed brass straight pattern instrumentation needle with serrated hose end.
   a. Chicago Faucets model 986-937CHAGVCP, WaterSaver model L4881F-225WSA or equal.
3. Plumbing lines - .25″ OD x .035″ wall chrome brass tubing with quick disconnect attached to the tube with compression fittings at the top of the upright. Each half of the quick disconnect (coupler and nipple) are valved.
4. The plumbing lines with the quick disconnects are to be arranged so services cannot be intermixed.
5. All service valves and quick connects shall be media keyed and color coded. Keyed media connects cannot be accidentally switched.

2.5 SERVICE CONNECTIONS

A. General requirements:
1. All plumbing services terminate at the top of the plumbing upright. Provide flexible tubing and quick connects to ceiling manifolds.
2. Power services will have a 20 amp cord plug extending 10′ above the top of the upright. Plug end to be NEMA L5-20P configuration, twist lock. Provide supplemental support for power cords attached to ceiling manifold.

2.6 SHELVES

A. General requirements for shelves:

1. All shelves supports shall be available in powder coated cold rolled steel.
2. Shelf platforms shall be phenolic resin with ¾″ x ¾″ solid wood bullnose front edge and wood rear edging raised to create a stop. Wood species and color to match mobile base cabinets. Top and bottom surfaces of phenolic shelves to be finished in matching color selected from manufacturers standard colors.
3. Shelves shall overhang 2″ behind the face of the vertical tubular support.
4. Shelf brackets: 11 gauge steel.
5. Vertical shelf adjustment: one-inch increments.

6. All shelves shall incorporate a reversible shelf retainer lip take is capable or can be positioned in the raised or flush position. Shelf lips can be repositioned without the use of tools. Lip height 1″.
7. Shelves can be mounted rear frames.
8. Load capacity: 40 pounds per linear foot up to 200 lbs. on a 48″ wide unit.

B. Outside Shelf:
1. Nominal dimensions:
   a. Widths: Varies
   b. Depth: 15″
2. Shelf brackets shall rise above the shelf surface to provide sides.

C. Shelf Types
1. Phenolic resin shelves with wood edges.
   a. Shelf support to be made up of 11 ga. steel and ¾″ square 11 ga. Tubing to meet load requirements.

2.7 WORK SURFACES

A. General requirements:
1. All work surface table frames supports and hardware shall be available in #304 stainless steel (#4 finish).
2. Work surfaces shall be molded resin.
3. Work surfaces shall be corner notched to the tube profile and hang 1″ behind the face of the vertical tubular support. Provide 1″ radius on all outside corners.
4. Load capacity: the work surface load rates are dependent of the work surface table frame and performance ratings (2.02).
5. Color: Light Grey

B. Work Surfaces:
1. Nominal Dimensions:
   a. Width: Varies
   b. Depth: 30″ or 24″ at ADA stations

2.8 FINISHES

A. Metal finish:
1. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pre-treat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
2. Application: Electrostatically apply urethane powder coat and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thickness: Liquid, dipped, solvent based finishes are not and will not be acceptable.
   a. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.
   b. Backs of cabinets and other surfaces not exposed to view: 1.2 mil average.

3. Color: Custom color to match metal casework specified in specification section 12 31 00.

B. Cabinet Surface Finish Tests: All casework construction and performance characteristics shall be in full compliance with SEFA 8 standards. At the owner's request, independent, third party performance testing must be submitted validating compliance and adheres to the finish specifications.

1. Chemical Spot Test
   a. Purpose of Test: The purpose of the chemical spot test is to evaluate the resistance a finish has to chemical spills.
      Note: Many organic solvents are suspected carcinogens, toxic and/or flammable. Great care should be exercised to protect personnel and the environment from exposure to harmful levels of these materials.
   b. Test Procedure:
      1) Obtain one sample panel measuring 14" x 24" (355.6mm x 609.6mm). The received sample to be tested for chemical resistance as described herein.
      2) Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73+ 3F (23(+ 2(C) and 50+ 5% relative humidity. Test the panel for chemical resistance using forty-nine different chemical reagents by one of the following methods:
      3) Method A – Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a one-ounce (29.574cc) bottle and inverting the bottle on the surface of the panel.
      4) Method B – Test volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24mm watch glass, convex side down.
      5) For both of the above methods, leave the reagents on the panel for a period of one hour. Wash off the panel with water, clean with detergent and naphtha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73±3°F (23°±2°C) and 50±5% relative humidity using the following rating system:
      6) Level 0 – No detectable change.
      7) Level 1 – Slight change in color or gloss.
      8) Level 2 – Slight surface etching or severe staining.
      9) Level 3 – Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

Test No.	Chemical Reagent	Test Method
1.	Acetate, Amyl	A
2.	Acetate, Ethyl	A
3.	Acetic Acid, 98%	B
4.	Acetone	A
5.	Acid Dichromate, 5%	B
6.	Alcohol, Butyl	A
7.	Alcohol, Ethyl	A
8.	Alcohol, Methyl	A

9.	Ammonium Hydroxide, 28%	B
10.	Benzene	A
11.	Carbon Tetrachloride	A
12.	Chloroform	A
13.	Chromic Acid, 60%	B
14.	Cresol	A
15.	Dichlor Acetic Acid	A
16.	Dimethylformanide	A
17.	Dioxane	A
18.	Ethyl Ether	A
19.	Formaldehyde, 37%	A
20.	Formic Acid, 90%	B
21.	Furfural	A
22.	Gasoline	A
23.	Hydrochloric Acid, 37%	B
24.	Hydrochloric Acid, 48%	B
25.	Hydrogen Peroxide, 3%	B
26.	Iodine, Tincture of	B
27.	Methyl Ethyl Ketone	A
28.	Methylene Chloride	A
29.	Mono Chlorobenzene	A
30.	Naphthalene	A
31.	Nitric Acid, 20%	B
32.	Nitric Acid, 30%	B
33.	Nitric Acid, 70%	B
34.	Phenol, 90%	A
35.	Phosphoric Acid, 85%	B
36.	Silver Nitrate, Saturated	B
37.	Sodium Hydroxide, 10%	B
38.	Sodium Hydroxide, 20%	B
39.	Sodium Hydroxide, 40%	B
40.	Sodium Hydroxide, Flake	B
41.	Sodium Hydroxide, Saturated	B
42.	Sulfuric Acid, 33%	B
43.	Sulfuric Acid, 77%	B
44.	Sulfuric Acid, 96%	B
45.	Sulfuric Acid, 77% and Nitric Acid, 70%, equal parts	B
46.	Toluene	A
47.	Trichloroethylene	A
48.	Xylene	A
49.	Zinc Chloride, Saturated	B

10) Acceptance Level: Results will vary from manufacturer to manufacturer. Laboratory grade finishes should result in no more than four Level 3 conditions. Suitability for a given application is dependent upon the chemicals used in a given laboratory.

2.9 TASKLIGHTS

A. General requirements
   1. Task light shall be a T5HQ type. Task lights shall be gangable with an integral on/off switch. Switch will turn on/off all lights ganged to it.
   2. Task light minimum performance levels shall be as follows: with 40 foot candle room lighting at the work surfaces, the

task light shall increase the work surface illumination to 80/100 foot candles.

3. Nominal dimensions:
   a. Widths: 35"

2.10 MAGNETIC MARKER BOARDS

A. General requirements
   1. Marker Boards shall be equal to Claridge Magnetic Marker Board, series 4.
   2. Nominal dimensions:
      a. Widths: As indicated on the drawings.
      b. Inset at workstations
      c. Surface mounted with concealed fasteners at end panels.
   3. Aluminum framed, 5/8” wide.
   4. Mechanically attached to a metal backing panel.
   5. Metal Backing Plate as detailed on drawings shall be mechanically attached to the casework uprights.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furniture system installation:
   1. Install system in strict accordance with manufacturer's instructions.
   2. Set system components level on two planes with no distortion. Securely anchored to building structure using concealed shims where necessary in wall mount.

B. Install applications casework, work surfaces and accessory items per Section 12345.

3.2 ADJUSTING

A. Repair or remove and replace defective work, as directed by Owner upon completion of installation.

3.3 CLEANING

A. Clean shop finished laboratory furniture system surfaces and touch up as required.

3.4 PROTECTION OF FINISHED WORK

A. Provide all necessary protective measures to prevent exposure of laboratory furniture system and attached components from exposure to other construction activity.

B. Advise contractor of procedures and precautions for protection of the installed laboratory furniture system and related components from damage by work of other trades.

END OF SECTION 123561

SECTION 12 35 62
CEILING MANIFOLD SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ceiling manifold system

B. Related sections:
   1. Section 01 53 13 - Alternates
   2. Section 12 36 00– Countertops and Fixtures
   1. Section 12 32 00 – Manufactured Wood Laboratory Casework.
   2. Section 12 35 61 – Manufactured Flexible Lab Casework.
   3. Division 22: Furnishing and installation of piping, drainline, traps, final connections and setting of sinks and fixtures.
   4. Division 23: Furnishing and installation of exhaust ductwork, transition(s), blowers and equipment, and final connection to fume hood(s).
   5. Division 27: Furnishing and installation of electrical utilities and final connections.

1.2 ALTERNATE PROPOSALS

A. Proposals are invited from alternate manufacturers only if they comply with the minimum design requirements and the minimum performance requirements set forth by SEFA and UL standards. A notarized letter stating full compliance must be included in alternate proposals signed by an independent testing laboratory recognized by ASTM E 548 to ensure compliance.

B. A copy of UL (Underwriters Laboratories) certification must be submitted with any alternate proposal noting full compliance to UL 962 testing and approvals.

1.3 SUBMITTALS

A. Shop Drawings: Provide 3/4"=1'-0" scale elevations of all components, cross sections, rough-in and anchor placements, tolerances and clearances. Provide 1/4"= 1'-0" rough-in plan drawings for coordination with trades. Rough-in shall show free area.

1.4 QUALITY ASSURANCE

A. Single source responsibility: Laboratory furniture system, casework, work surfaces, laboratory equipment, chemical fume hoods and accessories shall be manufactured or furnished by a single laboratory furniture company.

B. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produced high quality laboratory casework and equipment, and shall meet the following minimum requirements:
   1. Five years or more experience in manufacture of laboratory casework and equipment of similar product type specified.

C. Laboratory furniture systems and systems components must be *UL 962* submitted, approved and listed. Products must bear the UL Mark and shall be identified to those products that were evaluated by UL and found to comply with UL's requirements. The testing standard shall include Dielectric, Grounding Impedance, Stability, Strain Relief and Strength tests.

1.5 REFERENCE STANDARDS

A. All casework, worksurface and service fixture construction and performance characteristics shall be in full compliance with *SEFA* (Scientific Equipment and Furniture Association) standards. At the owner's request, independent, third party testing must be submitted validating compliance and adheres to the architectural specifications:
   1. SEFA 2.3 – Installation of Scientific Laboratory Furniture and Equipment.
   2. SEFA 3 – Work Surfaces
   3. SEFA 7 – Laboratory and Hospital Fixtures
   4. SEFA 8 – Laboratory Furniture

1.6 DELIVERY, STORAGE AND HANDLING

A. Schedule delivery of laboratory furniture system so that spaces are sufficiently complete that material can be installed immediately following delivery.

B. Protect finished surfaces from soiling or damage during handling and installation.

1.7 PROJECT CONDITIONS

A. Do not deliver or install equipment until the following conditions have been met:
   1. Windows and doors are installed and the building is secure and weather tight.
   2. Ceiling, overhead ductwork and lighting are installed.
   3. All painting is completed and floor tile is installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design, materials, construction and finish of laboratory furniture specified is the minimum acceptable standard of quality for flexible laboratory casework.

2.1 CEILING MANIFOLD SYSTEM

A. General Requirements
1. Ceiling utility panel shall integrate within most standard-duty T-grid acoustical suspended ceiling systems.
2. Utility panel shall provide a means to mount and connect electrical outlets, data outlets, quick connect service fixtures and burning gas quick disconnect.
3. Utility panels shall accommodate single sided and back-to-back bench configurations.
4. Utility panels will ship with junction boxes factory attached. Electrical outlets, data outlets, cover plates and service fixtures shall be ordered separately and field installed.
5. Utility panel shall be a minimum 18 gage cold rolled steel with a urethane powder coat finish.
6. Nominal Dimensions:
   a. Widths – 24″ x 24″
   b. Height (including junction boxes) – 3″
7. Burning gas quick connect to include supply shut-off prior to disconnecting.
8. Ceiling manifold systems shall be equipped with quick disconnect fitting for service tube ends. Each disconnect shall include nipple and coupler with color-keyed band marking media.
9. Coordinate supplemental support for power and service lines with adaptable tables.

2.2 Service lines: polyurethane for non-burning gases and \braiding stainless steel for burning gases will connect to disconnects from the ceiling manifold and the PLUMBING/FIXTURES

A. General requirements:
1. The table frame structure shall house a maximum of three plumbing services.
2. Needle Valves – chromed brass straight pattern instrumentation needle with serrated hose end.
3. Plumbing lines - .25″ OD x .035″ wall chrome brass tubing with quick disconnect attached to the tube with compression fittings at the top of the upright. Each half of the quick disconnect (coupler and nipple) are valved.
4. The plumbing lines with the quick disconnects are to be arranged so services cannot be intermixed.

5. All service valves and quick connects shall be media keyed and color coded. Keyed media connects cannot be accidentally be switched.

2.3 SERVICE CONNECTIONS

A. General requirements:
1. All services (plumbing, power, phone and data) terminate at the top of the plumbing upright.
2. Power services will have a 20 amp cord plug extending 10’ above the top of the upright. Plug end to be twist lock.
3. Phone line will have a female receptacle extending 6” above the upright. (Connections to the facility to be provided by others).
4. Data CAT 6 line will have a male plug extending 6” above the upright. (Connections to the facility to be provided by others)
5. rear frame disconnects.

2.4 FINISHES

A. Metal finish:
1. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pre-treat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
2. Application: Electrostatically apply urethane powder coat of selected color (from manufacturers standard colors) and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thickness: Liquid, dipped, solvent based finishes are not and will not be acceptable.
   a. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furniture system installation:
1. Install system in strict accordance with manufacturer's instructions.
2. Set system components level on two planes with no distortion. Securely anchored to building structure using concealed shims where necessary in wall mount.

B. Install applications casework, work surfaces and accessory items per Section 12345.

3.2 ADJUSTING

A. Repair or remove and replace defective work, as directed by Owner upon completion of installation.

3.3 CLEANING

A. Clean shop finished laboratory furniture system surfaces and touch up as required.

3.4 PROTECTION OF FINISHED WORK

A. Provide all necessary protective measures to prevent exposure of laboratory furniture system and attached components from exposure to other construction activity.

B. Advise contractor of procedures and precautions for protection of the installed laboratory furniture system and related components from damage by work of other trades.

END OF SECTION 123561

SECTION 12 36 00
COUNTERTOPS AND FIXTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies casework countertops with integral accessories.

B. Integral accessories include:

1. Sinks with traps and drains.
2. Eye and Face Wash Units.
3. Mechanical Service fixtures.
4. Electrical Receptacles.
5. Pegboards
6. Wall or Panel Mounted Service Fixtures

1.2 RELATED WORK

A. DIVISION 22, PLUMBING.

B. DIVISION 26, ELECTRICAL.

C. Equipment Reference Manual for SECTION 12 36 00, COUNTERTOPS.

1.3 SUBMITTALS

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

B. Shop Drawings

1. Show dimensions of section and method of assembly.
2. Show details of construction at 1/2 scale.

C. Samples:

1. 150 mm (6 inch) square samples each top.
2. Front edge, back splash, end splash and core with surface material and booking.

1.4 APPLICABLE PUBLICATIONS

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

B. American Hardboard Association (AHA):

A135.4-95.....Basic Hardboard

C. Composite Panel Association (CPA):

A208.1-09.....Particleboard

D. American Society of Mechanical Engineers (ASME):

A112.18.1-05.....Plumbing Supply Fittings

A112.1.2-04.....Air Gaps in Plumbing System

A112.19.3-08(R2004).....Stainless Steel Plumbing Fixtures (Designed for Residential Use)

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

A167-99 (R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

A1008-09.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength, Low Alloy

D256-06.....Pendulum Impact Resistance of Plastic

D570-98(R2005).....Water Absorption of Plastics

D638-08.....Tensile Properties of Plastics

D785-08.....Rockwell Hardness of Plastics and Electrical Insulating Materials

D790-07.....Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D4690-99(2005).....Urea-Formaldehyde Resin Adhesives

G21-96 (R2002).....Determining Resistance of Synthetic Polymeric Materials to Fungi

F. Federal Specifications (FS):

A-A-1936.....Adhesive, Contact, Neoprene Rubber

G. U.S. Department of Commerce, Product Standards (PS):

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

H. National Electrical Manufacturers Association (NEMA):

LD 3-05.....High Pressure Decorative Laminates

LD 3.1-95.....Performance, Application, Fabrication, and Installation of High Pressure Decorative Laminates

SPEC WRITE NOTE: Update materials requirements to agree with applicable requirements (types, grades, classes,) specified in the referenced Applicable Publications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Molded Resin:

1. Non-glare epoxy resin or furan resin compounded and cured for minimum physical properties specified:

Flexural strength	70 MPa (10,000 psi)	ASTM D790
Rockwell hardness	105	ASTM D785
Water absorption, 14 hours (weight)	.01%	ASTM D570

2. Material of uniform mixture throughout.

B. Stainless Steel: ASTM A167, Type 304.

C. Sheet Steel: ASTM A1008, cold rolled, Class 1 finish, stretcher leveled.

D. Particleboard: CPA A208.1, Grade 2-M-2.

E. Plywood: PS 1, Exterior type, veneer grade AC not less than five ply construction.

F. Hardwood Countertop: Solid maple, clear grade except where other wise specified.

G. Hardboard: ANSI/AHA A135.4, Type I, tempered, fire retardant treated, smooth surface one side.

H. Adhesive

1. For plastic laminate FS A-A-1936.
2. For wood products: ASTM D4690, unextended urea resin or unextended melamine resin, phenol resin, or resorcinol resin.
3. For Field Joints:
   a. Epoxy type, resistant to chemicals as specified for plastic laminate laboratory surfaces.
   b. Fungi resistant: ASTM G-21, rating of 0.

I. Fasteners:

1. Metals used for welding same metal as materials joined.
2. Use studs, bolts, spaces, threaded rods with nuts or screws suitable for materials being joined with metal splice plates, channels or other supporting shape.

2.2 SINKS

A. Molded Resin:

1. Cast or molded in one piece with interior corners 25 mm (one inch) minimum radius.
2. Minimum thickness of sides and ends 13 mm (1/2 inch), bottom 16 mm (5/8 inch).
3. Molded resin outlet for drain and standpipe overflow.
4. Provide clamping collar permitting connection to 38 mm (1-1/2 inch) or 50 mm (2 inch) waste outlet and trap, making sealed but not permanent connection.

B. Stainless Steel:

1. 18 gage stainless steel, of size and design shown.
2. ANSI/ASME A112.19.3, Type 304.
3. All interior corners of bowls shall be formed to manufacturer's standard radii.

4. Self rim for plastic laminate or similar tops with concealed fasteners.
5. Flat rim for welded into stainless steel tops.
6. Ledge back or ledge sides with holes to receive required fixtures when mounted on countertop.
7. For service lines from service fixtures, see other sections of specifications.
8. Apply fire resistant sound deadening material to underside.

2.3 TRAPS AND FITTINGS

A. Material as specified in DIVISION 22, PLUMBING.

B. For Molded Resin Sinks:

1. Chemical resisting P-traps and fittings for chemical waste service.
2. Provide traps with cleanout plug easily removable without tools.

C. For Stainless Steel Sinks:

1. Either cast or wrought brass or stainless steel P-traps and drain fittings; ASME A112.18.1
2. Flat strainer, except where cup strainer or overflow standpipe specified.
   a. Provide cup strainer in cabinet type 1B.
   b. Provide stainless steel overflow stand pipe to within 38 mm (1-1/2
3. Exposed surface chromium plated finish.

2.4 WATER FAUCETS

A. ASME A112.18.1.

1. Cast or forged brass, compression type with replaceable seat and stem assembly or replaceable cartridge.
2. Indexed four-arm handles either with or without head.
3. Gooseneck minimum clearance above countertop of 190 mm (7-1/2 inches), bent 180 degrees for vertical discharge.
4. Swing spouts elevated to clear handles.
5. Exposed brass surfaces chromium plated.
6. Cast combination hot and cold fixture with one piece body for multiple outlets.
7. Adapter type connection which will permit field conversion of swing spouts to fixed or gooseneck grouts or vice versa.
8. Pedestals Top for Laboratory:
   a. Modern design tapered to a round base, factory assembled and tested.
   b. Brass shanks, locknuts and washers for attaching to top or curbs.

9. Panel Mounted: Chicago Faucets model: 942, WaterSaver model L512WSA or equal.

B. Laminar flow control device on spouts.

C. Laboratory Faucets:

1. Female 9 mm (3/8 inch) IPS threaded outlet for attachment of filter pumps, hose connectors, anti-hose nozzle, or laminar flow control device on spout end.
2. Provide angle type vacuum breaker for fixture, designed for low flow, with built-in floating disk and renewable seat in vacuum breaker body.

D. Deionized Water Fixture:

1. Panel or Deck mounted.
2. Gooseneck spout with handle arranged for self closing and with hold open feature to open and close an inert silicone diaphragm valve.
3. Faucet designed to be chemically insert and resistant to leaching of inorganic contaminates, enhancement of bacteria growth, and internal corrosion.
4. Chicago Faucets model 828, WaterSaver model L2784WSA or equal.

E. Eye and Face Wash Unit Pull-Out-Type:

1. Deck mounted.
2. Designed for vandal resistant squeeze handle control valve and 8 foot hose.
3. Eye and face wash head, provide a soft stream for flushing action.
4. Valve, when opened; remain open until manually closed.
5. Provide dust covers for spray heads.
6. Provide in-line vacuum breaker.
7. Unit to meet ANSI Z358.1 – 2004 as both eyewash and a drench hose.
8. Deck mounted: Chicago Faucets model: 9305-NF, Watersaver model: EW1022 or equal.
9. Panel mounted: WaterSaver EW1041 or equal.

2.5 FUEL GAS, LABORATORY AIR AND LABORATORY VACUUM FIXTURES

A. Comply with criteria for faucets except as specified.

B. Needle valves with stainless steel replaceable cone and valve seat.

C. Provide valve with a bonnet with exterior packing and packing gland designed to permit valve to be repacked while under pressure.

D. Valves withstand a minimum pressure of 700 kPa (100 psi) without leakage.

E. Equip valves with four-arm handles and serrated hose ends. Do not provide laminar flow control device.

F. Provide duplex fixtures except where otherwise shown.

G. Factory assembled and tested.

H. Panel, deck or upright on flexible casework mounted.

2.6 FIXTURE IDENTIFICATION

A. Code fixtures with full view plastic index buttons.

B. Use following colors and codes:

SERVICE	COLOR	CODE	COLOR OF LETTERS
Cold Water	Dark Green	CW	White
Hot Water	Red	HW	White
Laboratory Air	Orange	AIR	Black
Fuel Gas	Dark Blue	GAS	White
Laboratory Vacuum	Yellow	VAC	Black
Distilled Water	White	DW	Black
Deionized Water	White	DI	Black
Oxygen	Light Green	OXY	White
Hydrogen	Pink	H	Black
Nitrogen	Gray	N	Black
All Other Gases	Light Blue	CHEM.SYM.	Black

2.7 ELECTRICAL RECEPTACLES

A. Hospital grade per electrical specifications.

B. Curb Mounted Receptacles:

1. NEMA 5-20R duplex in galvanized steel box.
2. Chromium plated brass or steel face plate.

C. Pedestal Mounted Receptacles:

1. NEMA 5-20R duplex installed in double faces.
2. Polished stainless steel or aluminum, or chromium plated brass pedestal.

D. Upright on Flexible Casework Mounted Receptacles:

1. NEMA 5-20R duplex installed in double faces.
2. Polished stainless steel or aluminum, or chromium plated brass pedestal.

2.8 COUNTERTOPS

A. Fabricate in largest sections practicable.

B. Fabricate with joints flush on top surface.

C. Fabricate countertops to overhang front of cabinets and end of assemblies 25 mm (one inch) except where against walls or cabinets.

D. Provide 1 mm (0.039 inch) thick metal plate connectors or fastening devices (except epoxy resin tops).
E. Join edges in a chemical resistant waterproof cement or epoxy cement, except weld metal tops.
F. Fabricate with end splashes where against walls or cabinets.
G. Splash Backs and End Splashes:
   1. Not less than 19 mm (3/4 inch) thick.
   2. Height 100 mm (4 inches) unless noted otherwise.
   3. Laboratories and pharmacy heights or where fixtures or outlets occur: Not less than 150 mm (6 inches) unless noted otherwise.
   4. Fabricate epoxy splash back in maximum lengths practical of the same material.
H. Drill or cutout for sinks, and penetrations.
   1. Accurately cut for size of penetration.
I. Metal Counter Tops:
   1. Fabricate up to 3600 mm (12 feet) long in one piece, including nosing, backs and ends.
   2. When counter tops exceed 3600 mm (12 feet) in length accurately fitted field joints are acceptable.
   3. Finish thickness at edges 32 mm (1-1/4 inch).
   4. Reinforced with minimum 1.5 mm (0.0598 inch) thick hat channel stiffeners, minimum of two stiffeners for units without sinks and three stiffeners for units with sinks welded or soldered to underside of top full length, except at sink openings.
   5. Apply sound deadening material on underside.
   6. Flange edges of tops down 32 mm (1-1/4 inch) and reinforce with concealed hardwood or with a steel frame.
   7. Grind welds smooth and finished on exposed surfaces to match finish specified.
   8. Stainless Steel Counter or Sink Tops:
      a. Where noted stainless steel except where specified for nourishment unit, unit kitchen, and medicine cabinet.
      b. Use 1.5 mm (0.0598 inch) thick stainless steel.
      c. Depth of splash backs and splash ends 25 mm (one inch) and turned down at least 13 mm (1/2 inch) at wall. Where faucets are located in splash backs, fabricate depth of splash backs 50 mm (2 inches) with provision made to receive required fixture.
      d. Where sinks occur fabricate top with 5 mm (3/16 inch) marine edge and fit flush with adjacent tops of other materials.
      e. Weld sink flush to counter top and finish to appear seamless.

J. Molded Resin Tops:
   1. Molded resin with drip groove cut on underside of overhanging edge.
   2. Finish thickness of tops, backsplashes and sidesplashes, minimum 25 mm (1 inch).
   3. Joints: Epoxy Type.
   4. Color: Light Grey.

K. Laboratory Shelf 254 mm (10 inch deep): Fabricate of corrosion resisting steel.

L. Counter Tops for Interchangeable Furniture: Counter tops, unless otherwise shown, are to be capable of vertical adjustment of 150 mm (6 inches). Fabricate tops, except CRS, in increments of units over which they fit with maximum length not to exceed 1950 mm (78 inches). Top section shall cover as many cabinet units as possible. Horizontal joints in counter tops at service strip and across depth of counter are be watertight when in place but of a type that can be easily separated and reset when counter top is moved up or down. Fabricate CRS tops in maximum lengths practicable, with field joints welded and ground smooth to match adjacent surfaces. Securely fasten to supporting rails with heavy metal fastening devices, or with screws, through pierced slots in such rails. Fabricate vertical splash back and reagent shelf in maximum length practicable of same material as working surface, except finish thickness shall be 19 mm (3/4 inch).

2.9 PEGBOARDS:

A. Pegboard: Fabricate of stainless steel acid resisting finish and equip with polypropylene pegs.

B. Provide CRS gutter and drain to sink.

2.10 FLAMMABLE STORAGE CABINETS

A. SCOPE

1. These requirements cover cabinets intended to be used to provide a storage area for limited quantities of flammable and combustible liquids in containers in compliance to ANSI/NFPA 30. Construction and performance requirements for cabinets are primary based on ANSI/NFPA 30.

2. A storage cabinet may have a maximum total storage capacity of not more than 120 gallons (454 Liters) Class I, Class II and Class IIIA flammable and combustible liquids shall be stored in a storage cabinet. Of this total, not more than 60 gal. (227 liters) shall be of Class I and Class II liquids. Not more than three cabinets shall be permitted to be located in the same fire area. The maximum capacity rating is assigned by the manufacture.

B. BASIS FOR REQUIREMENTS

1. Flammable storage cabinets shall conform to the construction, details and dimensions as set forth in the National Fire Protection Association (NFPA) 30 standards "Flammable and Combustible Liquids Code".

2. The requirements of this standard reflect test and practices used to examine characteristics of storage cabinets for the purpose of obtaining and gaining (Factory Mutual Research Corporation) Approval Class Number 6050.

3. FMRC Approval criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a follow-up program.

4. Listed cabinets that have been constructed and tested in accordance with FMRC Approval 6050 shall be acceptable, all other cabinets are not acceptable. Approved cabinets must carry the FMRC label.

5. In addition, all manufacturer's cabinets shall be constructed, tested and UL (Underwriters Laboratories) #1275 listed under *"Standards for Flammable Liquid Storage Cabinets"*. Approved cabinets must carry the UL 1275 label.

C. MATERIALS

1. The bottom, top, door and sides of the cabinet shall be at least 18-gauge thick, cold rolled sheet metal.

2. The construction shall be double walled with a 1-1/2" (38 mm) air space.

3. All joints shall be riveted, welded, or of an equally effective construction.

4. Doors shall be provided with a three-point locking arrangement and the door shall be located at least 2 inches (51 mm) above the bottom of the cabinet.

5. Cabinets shall be equipped with optional self-closing doors and a fusible link. A auto-latch and door synchronizer shall be incorporated as an integral function of the cabinet.

6. A means shall be provided for attaching a separate grounding wire at the base of the cabinet on the outside.

7. A cabinet may be equipped with upper and lower side vents. Such vents shall be arranged so they can be plugged externally but also arranged so that they can be opened for connection to ventilating means.

8. If the cabinet is vented for whatever reasons, the cabinet shall be vented outdoors in such a manner that will not comprise the specified performance of the cabinet, as

acceptable to the authority having jurisdiction. Ventilation shall provide approximately 10 air changes per hour (3-5 cfm).

9. If the cabinet is not vented, the vent openings shall be sealed with the plugs supplied with the cabinet or with plugs specified by the manufacturer of the cabinet.

10. Mobile cabinets will have vent holes factory plugged with a solid back panel. Unit volume shall hold a minimal of 18 gallons/6.1 liters. Height and width limitations shall be ADA complaint (34″ wide x 29-1/4″ high x 22″ deep). The total dead load of the unit shall be 190 lbs. plus a maximum of 100 lbs. live load or 300 lbs. The unit shall be supplied with the option of manual or self-closing doors.

11. All stationary models shall have removable backs to gain access to utilities for upgrades, repairs and maintenance.

12. Cabinet finish, fabrication and other requirements per this section per Fisher Hamilton L.L.C., 1316 – 18th Street, Two Rivers, WI 54241 requirements for steel casework.

D. PERFORMANCE

1. FIRE ENDURANCE TEST

a. A storage cabinet shall be subjected to a 10-minute fire test using the standard time-temperature curve specified in the Standards for Fire Tests on Door Assemblies, UL 10B (ASTM E152-81a, NFPA 251) *“Standard Methods of Fire Tests of Building Construction and Materials”*, to not more than 325 degrees F (162.8 degrees C) during the fire test. The cabinet shall limit the internal-measured at the center, 1 inch (25.4 mm) from the top. All joints and seams shall remain tightly closed during this test. No condition shall develop that indicate disintegration of parts or materials likely to affect the tightness of closure.

b. A production sample of manufacturer’s cabinet shall pass a loading test in accordance with the manufacturer’s rated liquid capacity. Loading is to be maintained for at least 72 hours. There shall be no (1) opening of seams or joints, (2) permanent distortion or deformation, or (3) interference of door opening, closing or locking as a result of this test.

E. MARKINGS

1. GENERAL

a. Each flammable liquid storage cabinet shall be marked with the company name or identification, the model or number designation, and cabinet capacity.

b. Each storage cabinet shall be marked “FLAMMABLES – KEEP FIRE AWAY” in letters not less than 2 inches (51 mm) high and in color contrasting to the background.

c. All markings shall be legible and durable. Markings shall be provided by stamping, by a metal name plate, by stenciling or painting, or equivalent.

d. If a manufacturer produces cabinets at more than one factory, each cabinet shall have a distinctive marking to identify it as a product of a particular factory.

e. FMRC Approval Sticker and UL Listing Sticker shall be clearly visible upon the top interior door panel. This sticker shall be a color contrasting to the background.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before installing countertops verify that wall surfaces have been finished as specified and that mechanical and electrical service locations are as required.

B. Secure countertops to supporting rails of cabinets with metal fastening devices, or screws through pierced slots in rails.

1. Where type, size or spacing of fastenings is not shown or specified, submit shop drawings showing proposed fastenings and method of installation.
2. Use round head bolts or screws.
3. Use epoxy or silicone to fasten the epoxy resin countertops to the cabinets.

D. Sinks

1. Install stainless steel sink in **stainless steel** tops with **full weld ground smooth** to form watertight seal under shelf rim.
   a. In laboratory fit stainless steel sink with overflow standpipe.
   b. Install faucets and fittings on sink ledges with watertight seals where shown.
2. Install molded resin sinks with epoxy compound to form watertight seal with underside of molded resin top.
   a. Install sink with not less than two channel supports with threaded rods and nuts at each end, expansion bolted to molded resin top.
   b. Design support for a twice the full sink weight.
   c. Install with overflow standpipes.

E. Faucets, Fixtures, and Outlets:

1. Seal opening between fixture and top.

2. Secure to top with manufacturers standard fittings.

F. Electrical Outlets:

1. Set in cutouts with manufacturers gasket sealing joint with top to prevent water leakage.
2. Install control unit and electric outlets where shown. Seal escutcheon plate at lap if on counter or top to prevent water leakage.

3.2 PROTECTION AND CLEANING

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

B. Clean at completion of work.

- - - E N D - - -

SECTION 13 21 29
CONSTANT TEMPERATURE ROOMS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies laboratory controlled temperature rooms.

1.2 RELATED WORK

A. Walk-in Refrigerators and Freezers: Section 11 41 21, WALK-IN COOLERS AND FREEZERS.

B. Refrigerant Piping: Section 23 23 00, REFRIGERANT PIPING.

C. Controls: Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.

1.3 QUALITY CONTROL

A. Manufacturer Qualifications: Manufacturer regularly and presently manufacturers prefabricated controlled temperature rooms.

B. Safety Standard: Units comply with ASHRAE 15 requirements for factory testing and nameplate.

C. Electrical Components and Devices: UL listed and labeled for intended use.

1.4 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Manufacturer's Literature and Data: Include the following:

1. Illustrations and descriptions of prefabricated controlled temperature rooms and factory-installed devices.
2. Catalog or model numbers for each item incorporated into the work.
3. Assembly instructions.
4. Diagrams and details of piping, wiring, and controls.
5. Operating-test data.

C. Performance Testing Reports: Indicate dates and times of tests and certify test results.

D. Operating Instructions: Comply with requirements in Section 01 00 00, GENERAL REQUIREMENTS.

1.5 APPLICABLE PUBLICATIONS

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

B. American National Standards Institute/National Electrical Manufacturers Association (ANSI/NEMA):
WD 6-2002(R2008).....Wiring Devices--Dimensional Requirements

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
15-2010.....Safety Code for Mechanical Refrigeration

PART 2 - PRODUCTS

2.1 WALK-IN CONTROLLED TEMPERATURE ROOM

A. General: Furnish and install prefabricated, sectional, all-metal clad, modular, controlled temperature rooms that are designed for field assembly, to establish temperature specified within two hours, and to maintain that temperature without further attention.

B. Case: Include modular panels for walls, floor, ceiling, and door(s).

1. Panel Construction: Double-wall construction, prewired, and insulated and vapor-sealed sections mechanically locked in place from interior of room without the use of special tools. Each panel passes through a 1829 mm (6 feet) wide corridor and 813 by 2032 mm (32 by 80 inch) doorway. Panel construction does not incorporate wood. Provide 2″ thick insulated floor with integral ramp.

2. Door:

a. Not less than 864 mm (34 inches) wide by 1905 mm (75 inches) high; construction matching that of panels; with observation panel of sealed multipane glass not less than 305 mm (12 inches) square.

b. Door handle and latch permits exterior locking with safety release to allow door to be opened from inside when locked on outside. Safety release will not disturb vapor seal when operated nor require tools to reactivate.

c. Equip door jambs of rooms capable of attaining a temperature of 4 degrees C (39 degrees F) or colder with concealed heater to prevent frost formation or condensation.

3. Access panel: Equip unit with a 24″ x 24″ insulated access panel to access roof mounted items. Panel construction to match wall/ceiling construction.

4. Access Ports: Equip units with PVC or neoprene sleeves or gaskets for service entrances. Vapor seal access ports at interior and exterior of panels.
4. Finishes:
   a. Interior Walls and Ceiling: Chemical-resistant nontoxic odorless epoxy, not less than 0.0254 mm (1 mil) thick.
   b. Exterior: Baked enamel or matching interior.
5. Pressure Relief Port: Equip freezers that will operate at minus 18 degrees C (0 degrees F), or lower with 2-way type ports that allow for an increase or decrease of air pressure on the interior of the freezer to equalize with air pressure on the exterior.

C. Condensing Units:
1. Air-cooled type. Do not locate compressors on top of refrigerator or freezers. Provide refrigerant piping to remote mechanical room location indicated on drawings.
2. Provide positive oil lubrication and oil-level indicating device for each compressor. Equip water-cooled units with water regulating valve.
3. Pressure Switches: Automatic-reset low-pressure switch, and automatic- or manual-reset high-pressure cutout.

D. Controls:
1. Mount regulating and indicating devices in console or panel adjacent to and no higher than door. Calibrate controls, thermometer, and recorder in increments of 1 degree C (1.8 degrees F).
2. Operating Temperature Control: Self-contained remote bulb, liquid filled, reverse acting, adjustable, and sealed mercury-bulb-type thermostat, with three-degree differential.
3. Humidity: Electric control capable of maintaining selected relative humidity within plus or minus 5 percent.
4. Alarm and Override Temperature Control: Equip with sensing devices and circuits that take over control, initiate corrective action, and activate an audible signal device in event of temperature variation in room of more than 3 degrees C (5 degrees F) from set temperature. Signal automatically resets on return of room to set operating temperature.

E. Air Circulation System: Consisting of positive-pressure ceiling plenum, floor-level air returns, blower, ducts, and diffusion devices, and provides means of regulating fresh air drawn into room.
   1. Equip air intake and exhaust with a replaceable filter.
   2. Air recirculated continuously by lifetime-lubricated blower(s).

G. Refrigeration System: Equip controlled temperature rooms specified for operation below ambient temperature with hermetically sealed refrigeration system designed for continuous operation in ambient temperature of 35 degrees C (95 degrees F) that is capable of maintaining lowest temperature specified.
   1. Defrost: Cycle not more than 15 minutes' duration. Temperature of room will not rise more than 1 degree C (1.8 degrees F) during defrost.
   2. Install components to enable access for servicing.
   3. Insulate refrigerant lines to prevent formation of condensate, and protect exposed lines with stainless-steel cover. Provide condensate piping to drain.
   4. Equip with refrigerant vapor detectors and two monitor and alarm devices. Locate one monitor and alarm device local to the equipment and one in the electrical communication closet servicing the equipment.

J. Temperature Control:
   1. Refrigerator: Variable temperature within the range of 0 to 4 degrees C (32 to 39 degrees F)
      a. Control Point: 2.0 degrees C (3.6 degrees F), plus or minus.
      b. Uniformity: 1.0 degree C (1.8 degrees F).

K. Interior Equipment: Install fastening and hanging devices for equipment specified in other sections of the specification.
   1. Lighting: Rapid start, 277 volt vapor-proof fluorescent lighting to produce not less than 753 lux (70 fc) at 1016 mm (40 inches) above floor. Mount ballasts external and other heat-producing components, except lamps. Provide occupancy sensor for automatic lighting control.
   2. Electrical Receptacles: Equip with empty ¾″ conduits, back-boxes and stainless steel cover plates:

a. Three for power (42″ A.F.F.).
b. Two for data (42″ A.F.F.).
c. One for phone (46″ A.F.F).
d. Conduits to extend above unit roof.

3. Shelving: Provide reinforcing in walls for shelving and wall cabinets.
4. Floor Mat: Equip with removable 5 mm (3/16 inch) thick, neoprene floor mat with nonskid tread that covers area of floor not occupied by fixed casework.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble walk-in units and install refrigeration equipment according to manufacturer's written instructions. Make panel joints tight and seal panel penetrations to prevent condensation or frosting.
   1. To the greatest extent possible, mount pipe, conduit, and instrumentation on the exterior of rooms; pass connections to serviced devices through drilled penetrations.
B. Piping, Pipe Insulation, and Refrigerant: Comply with requirements in Section 23 23 00, REFRIGERANT PIPING.
C. Controls: Comply with requirements in Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.

3.2 REFRIGERATOR/FREEZER STARTUP AND PERFORMANCE TESTING

A. Startup Temperature Reduction: On startup, reset the room thermostats daily for a maximum temperature drop of 8 degrees C (15 degrees F) per day down to 2 degrees C (36 degrees F), and a maximum of 6 degrees C (10 degrees F) per day between 2 degrees C (36 degrees F) and operating temperature.
B. Performance Testing: Perform test to comply with Section 01 00 00, GENERAL REQUIREMENTS. Operate each system and record conditions hourly for eight hours. Submit the following information:
   1. Station, building and system identification, Contractor, and date and time.
   2. Compressor Nameplate Data: Make, model, horsepower, RPM, refrigerant, and charge in kg (lb).

3. Compressor Operation: Approximate percentage of running time, pressure gage readings, actual amps (starting and running), condenser-water temperature in and out, or condenser entering-air temperature.
4. Room temperatures.
5. Defrost and drain functions of unit coolers. Demonstrate alarm functions.

3.3 PROTECTING AND CLEANING

A. Protect equipment from dirt, water, and chemical or mechanical injury during the remainder of the construction period.

B. At the completion of work, clean equipment as required to produce ready-for-use condition.

3.4 INSTRUCTIONS

Instruct personnel and transmit operating instructions in accordance with requirements in Section 01 00 00, GENERAL REQUIREMENTS.

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SECTION 13 99 98
EQUIPOTENTIAL SURFACE AND ELECTROMAGNETIC SHIELD

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the equipotential surfaces and the electromagnetic shield for the rooms as noted on the drawings.

B. The equipotential surface consists of a Faraday cage made of transformer steel and installed inside the room. The steel is installed on all five sides of the room, including the floor, and connects to the steel roof deck above.

C. The Faraday cage arrangement provides the equipotential surface for high frequency currents that may exist on various surfaces. The steel used in the Faraday cage provides magnetic shielding for stray 60 Hz AC magnetic fields that may exist in the area.

D. This section includes the following items:

1. Magnetic shielding material used to install equipotential surfaces.
2. Bonding jumpers for high frequency R.F. currents.
3. Adhesive to install the steel sheet on the floor.
4. Installation instructions.

1.2 RELATED WORK

A. Alternates: Deduct

B. Masonry Mortar

C. Structural Steel

D. Steel Door Frames

E. Hardware for Doors

F. Installation for Doors and Hardware

1.3 MANUFACTURER’S QUALIFICATIONS

A. Contracting Officer must approve product or source of proposed manufacturer and suppliers; approval will be based upon submission by Contractor certifying that:

1. The manufacturer regularly and presently manufacturers the electromagnetic shielding product as specified as one of its principal products.
2. The manufacturer’s product submitted has been in satisfactory and efficient operation on three installations similar and equivalent to this project for three years.

3. Manufacturer submits list of installations.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, Shop Drawings, Product Data, and Samples.

B. Shop Drawings: Show actual construction and installation details for the shielding product and associated equipment.

C. Manufacturer's Literature: Provide manufacturer's literature for the shielding product and all associated equipment.

1.5 WARRANTY

A. Provide the installation warranty for the equipotential surfaces and electromagnetic shielding against defects in workmanship and material subject to terms of "Warranty of Construction" article in General Conditions, except that warranty period shall be two years.

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. Military Handbook, MIL-HDBK-419A 29 December 1987, "Grounding, Bonding, and Shielding for Electronic Equipment and Facilities."

C. Department of the Army, Technical Manual TM5-690, Grounding and Bonding in Command, Control, Communication, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) Facilities.

D. IEEE Standard 1100-1992, IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.

E. Radio Frequency Shielded Enclosures, Military Handbook, MIL-HDBK-1195, 30 September 1998, Department of Defense.

F. MIL-STD-461C, Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference, 4 August 1986.

G. Architectural Electromagnetic Shielding Methods, IEEE Press, 1992.

H. MIL-STD-1857, "Grounding, Bonding and Shielding Practices".

I. MIL-STD-188-124B, "Grounding, Bonding and Shielding".

PART 2 - PRODUCTS

2.1 MATERIAL FOR EQUIPOTENTIAL SURFACES AND ELECTROMAGNETIC SHIELD

A. This material shall be iron alloy steel (transformer steel). This alloy contains 5% silicon and very low manganese, phosphorous, and sulfur.

B. The material shall be M36 transformer steel.
C. The thickness of the steel sheet shall be #24 gauge.
D. The steel shall be coated with C3 coating.
E. The material shall be purchased either in sheets or in rolls. If rolls are purchased, then the material shall be straightened by rolling.
F. The sheet material shall be free of kinks and lumps before using. The materials must be flat on substrate.

2.2 ADHESIVE FOR INSTALLING STEEL SHEETS ON THE FLOOR

A. This adhesive shall be used on the concrete floor for installing the steel sheet. The same material shall be used on the steel sheets for installing the room floor covering, (installed by others).
B. The adhesive shall be an aerosol water-based adhesive that is pressure sensitive, VOC free, non-flammable, and is a non-HAP, emitting no dangerous fumes or odors.
C. The material shall have less than 0.0 g/ml VOC content when tested per EPA test method 8260B.
D. The material shall be water cleanable when wet.
E. The material shall have high moisture and PH resistance.
F. The material shall use non-ozone depleting HFC propellant.
G. The material shall withstand 8 lbs./1000 sq.ft. of vapor emissions, 90% RH and 11 PH.
H. The material shall be nonflammable with NFPA 704 flammability rating of zero.
I. The dry time for the adhesive shall be 10 to 20 minutes.
J. The adhesive material shall allow foot and machinery traffic immediately.
K. The material shall have a delamination warranty of five (5) years after installation when the installation is done in accordance with the adhesive manufacturer’s requirements. Other conditions for the delamination warranty shall be as follows:
   1. The warranty shall hold as long as moisture vapor emissions do not exceed 85% RH when tested in accordance with ASTM F2170.
   2. For moisture in concrete slab conditions up to 7 lbs. per 1000 sq.ft. per 24 hours, when tested with pre-packaged calcium chloride crystal kit, performed in accordance with ASTM F1869.

3. For concrete slab conditions up to a PH of 11 when tested in accordance with ASTM F710.

L. The material shall be suitable for adhering resilient sheet vinyl flooring and formulated for use in medical/healthcare applications.

M. The acceptable product shall be Model 3500 manufactured by Spray-Lock or equivalent.

2.3 CLAMPS FOR BONDING PIPES

A. This product shall be used around all metallic pipes and conduits which enter or leave the shielded enclosure.

B. Select the proper clamp for the pipe size being used.

C. The bonding of the pipes to the equipotential surface shall be by the installer of the equipotential surface.

D. The clamps shall fit snugly around the pipe. The clamps shall be made of stainless steel or of tinned copper.

E. The clamps shall be two inch (2″) wide. It shall be suitable for bonding with flat bonding straps specified separately.

F. Acceptable manufacturers shall be:

1. Harger
2. Heary Brothers
3. Thomas and Betts
4. Kearney Power Systems

2.4 FLAT BONDING STRAPS

A. This item shall be used to bond the pipes, conduits, and ducts to the equipotential surface.

B. The bonding strap at equipotential rooms shall be a flat braid type with tin plated copper braids.

C. The minimum strap width shall be 1″.

D. The bonding strap shall be un-insulated with minimum of two screw eyelets on a flat connection.

E. The eyelet connection shall be tinned copper.

F. The length of the braid shall be minimum required. Do not use sharp bends in the installation.

G. The length of the braid shall be 12″ or less as required. The ferrule length for a two hole strap shall be 2.50″.

H. The acceptable manufacturers shall be:

1. Harger

2. Panduit
3. Thomas and Betts
4. Kearney
5. Salisbury

PART 3 - EXECUTION

3.1 INSTALLER QUALIFICATIONS

A. The installer of the equipotential surface shall have the experience of such installations in hospitals, biomedical labs, and R.F. shielded enclosures for the military.

B. The installer shall have minimum of eight (8) successful installations of equipotential surfaces in hospitals and biomedical labs.

C. The installer shall be familiar with the military standards for R.F. shielding and the grounding and bonding requirements.

D. The installer shall use in-house expertise for the installation of equipotential surfaces. The use of tradesmen not experienced in the special installation procedures is not permissible.

3.2 INSTALLATION REQUIREMENTS FOR FLOOR SHIELD

A. The equipotential surface steel shall be installed on the floor per the requirements shown on the drawings.

B. The steel sheet shall be installed on the floor using the specified adhesive.

C. Follow the installation requirements from the adhesive manufacturer.

D. The steel sheets shall be laid on the floor such that the gaps between the sheets are minimized. The gap shall be less than 1/8”.

E. Carefully examine the floor, clean the floor, and ensure that it is free of moisture and other contaminants before spraying with the adhesive.

F. The steel sheet shall be installed perfectly flat on the floor. Install the sheet to the edge of the room.

G. Install metallic studs over the steel plate using approved anchoring method. This will provide electrical continuity between the floor steel and the steel on the walls.

H. It is desirable not to poke holes through the floor shield. (The wall shield may be cut to install electrical boxes or pipes and conduits.)

I. The shielding installer shall coordinate with the finish flooring installer to ensure that the specified adhesive is used over the steel shield.

3.3 INSTALLATION REQUIREMENTS FOR WALL SHIELDING

A. Install steel studs over the floor steel using approved anchoring system.

B. The steel studs shall be installed all the way up and connected to the steel deck of the floor above.

C. Install sheet steel over the studs. Overlap by 0.75″ to 1″. Install sheet metal screws on the studs every 6″ minimum.

D. Overlap sheet steel horizontally and install on a horizontal metal stub in the stud to ensure electrical continuity.

E. On the top of the room, carefully connect the sheet steel with the roof deck. This can be done by either gently bending the sheet steel with large radius of more than 8″ or terminate on a steel stud frame attached to the roof deck.

F. The wall steel shield may be cut in places where electrical boxes are to be installed. Holes may be drilled to allow the ducts, pipes, and conduit to penetrate the equipotential surface. Such holes shall be as large as minimally required.

G. All the metallic ducts, pipes, and conduits shall be bonded to the steel wall at the point of entry and exit from the room. The bonding shall be made using the specified braided bonded jumpers of minimum length as required. The bonding details are provided in the drawings.

H. All the electrical boxes in the rooms shall be installed and bonded to the wall steel.

I. The bonding jumpers shall always terminate on a steel stud and not on the thin steel plate.

J. The room finish shall be applied over the steel equipotential surface as shown on the architectural drawings.

K. The wall steel shall also be terminated on the steel door frame and connected to it using sheet metal screws or appropriate fastening method to ensure electrical continuity.

L. The door when closed shall make electrical contact with the frame via metallic latch. The metal door can have appropriate finish as specified in the project documents.

3.4 GROUNDING BAR

A. Provide a grounding bar in the room. This bar shall be made of copper, 10″ long, 2″ wide, and 1/2″ thick. The grounding bar shall have 16 holes of 0.28″ diameter.

B. Install the grounding bar on Johnny Balls, 4″ high.

C. Bond the grounding bar to the equipotential surface.

3.5 ADDITIONAL INSTALLATION REQUIREMENTS

A. In the shielded room, use only single phase power circuits. Do not use three phase power in the rooms.

B. All power cabling should be twisted using four twists per foot before installing in the conduit.

C. Do not use shared neutrals. Each location shall have its dedicated neutral wire.

D. Do not install electric panels in the wall of the rooms. All electric panels shall be minimum of 25 feet from the room wall.

3.6 PERFORMANCE REQUIREMENTS

A. The electromagnetic shielding specified in this section is used to provide minimal “H-field,” “E-field” and some “plane wave” shielding. The other purpose of the shield is to provide equipotential surface for the room as shown in the drawings.

B. The requirements for the shielding effectiveness are quite nominal.
   1. H-Field 20 kHz, 20 dB shielding effectiveness.
   2. E-Field 20 kHz, 40 dB.

C. The project does not require that the enclosure be tested. If the installation is provided as detailed in the drawings, then shielding effectiveness better than the listed nominal number is easily obtained.

D. The other important function of the shield in the room is to provide equipotential surfaces. For providing effective shielding, the integrity of the shield must be carefully maintained per the details provided in the drawings.

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